Industrialisation for Economic Transformation

Economy-wide impacts of agro-processing development in Tanzania

by

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DECLARATION

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Abstract

Economic development has generally been viewed as a process of economic transformation. In countries where this economic transformation does not take place, socio-economic challenges prevail. Success in virtually all developed countries has been associated with diversification of the economy through industrialisation, particularly manufacturing expansion.

In Tanzania, industrialisation and economic transformation are still to take place as they did not fare well in the past. Labour moving out of agriculture has mainly been absorbed in services and informal sectors that are not as highly productive as manufacturing. Agriculture still accounts for the majority of the economy's employment and has a substantial share in output and exports. The contribution of manufacturing activities in the economy has remained limited. As a consequence, the current high economic growth rate has not been matched with quality jobs and rapid growth in incomes and thus poverty has remained high. The government has identified the need to transform the economy through expansion of agro-processing activities to create the much-needed jobs and incomes.

The study reviewed that the prevailing conditions in the Tanzanian economy support the need for agro-processing activities. The activities have the potential to lead the process of economic transformation. A number of challenges, however, limit the expansion of the agro-processing in Tanzania and will need to be addressed through industrial policy.

Against this background, the study examined the economy-wide impacts of agro-processing expansion in Tanzania. The investigation was done through simulating the impacts of policies aimed at improving productivity in agro-processing, expanding export markets for agro-processed products, increasing the quantity of educated labour, and increasing agricultural production to support the expansion of processing activities. The study used the International Food Policy Research Institute's recursive dynamic computable general equilibrium model for the simulation analysis. The model which was calibrated to a 2016 Tanzania social accounting matrix was best suited for the analysis as it provided the impacts over a longer period of time.

The findings suggest that agro-processing activities play an essential role in the Tanzanian economy and hence the government should continue to implement policies to encourage more investments in the sector. Productivity increases in the agro-processing sector are important for enhancing the sector's production and competitiveness which leads to increased exports and import substitution of agro-processed products. Policies such as attracting FDIs to improve productivity should thus be encouraged. Export push strategies will boost exports but without improving the sector's production capabilities, growth will slow down. On the other hand, horizontal policies such as increasing education may not necessarily be sufficient for the sector's expansion but are crucial for the expansion of the whole economy. Productivity increases in agricultural activities will also be crucial to expand the input base

for agro-processing activities. The simulation analysis also highlights that policy outcomes among the subsectors within the agro-processing sector may differ. Thus, policies must be targeted at the subsector level. In addition, it is also important to note that different policies that can expand the agro-processing sector have different implications on factor and household incomes.

Opsomming

Ekonomiese ontwikkeling word oor die algemeen gesien as 'n proses van ekonomiese transformasie. In lande waar hierdie ekonomiese transformasie nie plaasvind nie, heers sosio-ekonomiese uitdagings. Sukses in feitlik alle ontwikkelde lande hou verband met diversifisering van die ekonomie deur industrialisasie, veral die uitbreiding van vervaardiging.

In Tanzanië moet industrialisasie en ekonomiese transformasie steeds plaasvind, aangesien dit nie in die verlede goed gevaar het nie. Arbeid wat uit die landbou beweeg, is hoofsaaklik opgeneem in dienste en informele sektore wat nie so produktief is soos vervaardiging nie. Die landbou is steeds verantwoordelik vir die meerderheid van die indiensneming van die ekonomie en het 'n aansienlike aandeel in produksie en uitvoer. Die bydrae van vervaardigingsaktiwiteite in die ekonomie het steeds beperk gebly. Gevolglik is die huidige hoë ekonomiese groeikoers nie gekoppel aan kwaliteitsgeleenthede en vinnige groei in inkomste nie, en armoede bly dus steeds hoog. Die regering het die behoefte geïdentifiseer om die ekonomie te transformeer deur die uitbreiding van landbouverwerkingsaktiwiteite om die broodnodige werkgeleenthede en -inkomste te skep.

Die studie oorsig dui daarop dat die heersende toestande in die Tanzaniese ekonomie die behoefte aan agro-verwerkingsaktiwiteite ondersteun. Die aktiwiteite het die potensiaal om die proses van ekonomiese transformasie te lei. 'n Aantal uitdagings beperk egter die uitbreiding van die agro-verwerking in Tanzanië en moet deur die nywerheidsbeleid aangespreek word.

Teen hierdie agtergrond is die gevolge van die uitbreiding van landbouprosessering in Tanzanië oor die hele ekonomie ondersoek. Die ondersoek is gedoen deur die impak van beleid te simuleer wat daarop gemik is om produktiwiteit in landbouverwerking te verbeter, die uitvoermarkte vir agro-verwerkte produkte uit te brei, die hoeveelheid opgeleide arbeid te vergroot, en landbouproduksie te verhoog om die uitbreiding van verwerkingsaktiwiteite te ondersteun. Die studie het die rekursiewe dinamiese berekenbare algemene ewewigsmodel van die International Food Policy Research Institute gebruik vir die simulasie-analise. Die model, wat gekalibreer is met 'n 2016 soisale rekeningkundige matriks vir Tanzanië, is die beste geskik vir die ontleding, aangesien dit die impakte oor 'n langer tydperk gee.

Die bevindinge dui daarop dat landbouverwerkingsaktiwiteite 'n wesenlike rol in die Tanzaniese ekonomie speel, en daarom moet die regering voortgaan om beleid te implementeer om meer beleggings in die sektor aan te moedig. Toename in produktiwiteit in die agro-vervaardiging sektor is belangrik vir die verbetering van die sector se produksie en mededingendheid wat lei tot meer uitvoere en invoersubstitusie van verwekte landbou produkte. Beleid, soos om buitelandse beleggings te lok om produktiwiteit te verhoog, moet dus aangemoedig word. Strategieë wat uitvoere aanmoedig sal uitvoere 'n hupstoot gee, maar sonder om daarmee saam die produksievermoë van die sektor te verbeter, sal groei vertraag. Aan die ander kant is horisontale beleid soos die verhoging van onderwys moontlik nie

noodwendig voldoende vir die uitbreiding van die sektor nie, maar dit is van uiterste belang vir die uitbreiding van die hele ekonomie. Produktiwiteitsverhogings in landboubedrywighede sal ook van kardinale belang wees om die insetbasis vir landbouverwerkingsaktiwiteite uit te brei. Die simulasie-analise beklemtoon ook dat die beleidsuitkomste vir die subsektore van die agro-verwerkingsektor kan verskil. Dus moet beleid op die subsektorvlak geteiken word. Daarbenewens is dit ook belangrik om daarop te let dat verskillende beleidsrigtings wat die agro-verwerkingsektor kan uitbrei, verskillende gevolge vir faktor- en huishoudelike inkomste het.

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Abbreviations

ASDP	Agricultural Sector Development Programme
CES	Constant elasticity of substitution
CET	Constant elasticity of transformation
CGE	Computable General Equilibrium
EAC	East African Community
ECA	European Commission on Africa
FDI	Foreign Direct Investment
FYDP	Five Year Development Plan
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
IIDS	Integrated Industrial Development Strategy
LES	linear expenditure system
LTPP	Long Term Perspective Plan
MITI	Ministry of Industry and Trade
MOF	Ministry of Finance
NBS	National Bureau of Statistics
SAM	Social Accounting Matrix
SAP	Structural Adjustment Programme
SIDP	Sustainable Industrial Development Plan
SSA	Sub-Saharan Africa
TFP	Total factor productivity
TZS	Tanzanian shilling
TSED	Tanzania Socio-Economic Database
URT	United Republic of Tanzania
WDI	World Development Indicators
UNSD	United Nations Statistics Division
UNIDO	United Nations Industrial Development Organization

Chapter 1: Introduction

1.1. Economic development: The African experience

After decades of stagnant growth and being regarded as "hopeless" (The Economist, 2000), the Sub-Saharan Africa (SSA) region is now rising with its rapid growth only second to that of Asia (Badiane and Makombe, 2014; 2015). Such impressive performance has now been associated with the phrase "African growth miracle" (Young, 2012; McMillan and Harttgen, 2014).

While the growth in the region's output is worth celebrating, SSA has lagged behind the rest of the world in economic development (Ajakaiye and Jerome, 2014) and thus a lot still needs to be done. Economic development goes beyond bringing a region out of stagnation or ensuring growth; it also entails that the living standards must rise to converge to that of rich countries (Todaro and Smith, 2015). This improvement of living standards which include, among other aspects, the addition of quality jobs, the raising of incomes and the equitable distribution of the incomes, and consequently, the reduction of poverty (Todaro and Smith, 2015), is still a concern in SSA. The region has created fewer jobs offering high wages and opportunities to acquire skills (Page and Shimeles, 2014). Besides, while the high growth has led to the expansion of the middle class, poverty rates have remained very high (Badiane and Makombe, 2014; Page and Shimeles, 2014; Kormawa and Jerome, 2015; Barret et al., 2017). The number of people living in poverty has doubled since the mid-1980s (Kormawa and Jerome, 2015). (Arndt et al., 2014). This challenge has prompted a look into the drivers of growth in the SSA region.

The recent growth in Africa has partly been credited to improved investments and macro-economic management since the adoption of the international financial institutions' neoclassical structural adjustment policies (SAPs) in the 1980s and 1990s (Badiane and Makombe, 2014; 2015). Nevertheless, the region has mostly benefited from a favourable global environment over the past two decades (Rodrik, 2016a). First, global interest rates have been low. Secondly, the continent enjoyed favourable oil, and commodity prices, which boosted the exports of non-oil exporters in the region (Rodrik, 2016a; Badiane and Makombe, 2014; 2015). Third, the rapid expansion of China stimulated the demand for Africa's natural resources. The sustainability of growth based on favourable external environment is, however, questionable as the conditions can change (Rodrik, 2016a).

Theory and historical evidence show that virtually all successful countries went through a process of modern economic growth (Kuznets, 1966) in which growth was accompanied by structural transformation (Aryeetey and Moyo, 2012; Page, 2012; Mensah et al., 2016). Structural transformation entails the movement of labour and other resources out of the less productive traditional agriculture and informal sectors, into the highly productive modern industrial and service sectors (Kuznets, 1973; Aryeetey and Moyo, 2012; Page, 2012). During the developing stages of today's rich countries, labour-intensive manufacturing industries absorbed the abundant labour flowing out of agriculture resulting

in rapid productivity increases and economic growth, the creation of quality jobs and poverty reduction (Dinh et al., 2012; Diao et al., 2019). Economic growth in Africa has, however, not been accompanied by the type of structural transformation that was observed in successful countries (Dinh et al., 2012; Diao et al., 2019). Unfortunately, industrial activities have remained low in Africa, and their contribution has instead declined since the implementation of the SAPs (Wuyts and Kilama, 2016). Thus, while signs of structural (economic) transformation have been observed, labour has rather moved into services and mainly informal sectors whose productivity is not much different from that of traditional agriculture (Mensah et al., 2016; Diao et al., 2019). As highlighted by McMillan et al. (2017), emphasis on service-based economic transformation will offer little to the much-needed changes in the region (Diao et al., 2019).

Since the beginning of the new millennium, much attention has been put on the role of agriculture to drive structural transformation. There is, however, growing solidarity among various scholars for a need to refurbish the industry in Africa (Ajakaiye and Page, 2012), and the agro-industry has been cited among key priority sectors to accelerate industrialisation in the region (McMillan and Headey, 2014). African governments are realizing this need for industrialisation and plans have been set to prioritise manufacturing. Economic transformation and industrialisation have thus topped the development agenda in the region. However, the options that the region has for accelerating structural transformation are still unclear. With the heterogeneous nature of the African economies, it is important that the studies be done at country level. This study specifically focuses on exploring the potential role of agro-processing development as part of industrialisation in Tanzania.

1.2. Agro-industrialisation in Tanzania

Tanzania is among the top ten fastest-growing economies, leading the "Africa's growth miracle", averaging 5-7 percent GDP growth per annum since the beginning of the new millennium (Page 2016). However, like most of the African countries (Kormawa and Jerome, 2014), this high growth did not result in significant poverty reduction, the creation of high-quality jobs and productivity increases (Mashindano and Maro, 2011; Arndt et al., 2014; Page, 2016; URT, 2016a; Pauw et al., 2018). The lack of economic transformation has been identified to be the source of these economic problems (Page 2016). Agriculture is still the largest contributor to employment, and it has a significant share in both GDP and exports. The levels of manufacturing activity in Tanzania are, however, substantially lower than they should be based on per capita income (Dinh et al., 2012). The Tanzanian government has, however, identified the need for "nurturing industrialisation for economic transformation and human development" (URT, 2016a).

The government is currently implementing several horizontal policies such as attracting foreign direct investments, investing in infrastructure and education, among others to support the industrialisation process. Various sector-specific investments are also being implemented to promote subsectors with

the highest growth potential that is poverty reducing with opportunities for employment and structural change (URT, 2016a). The agro-processing sector has been identified among the priority sectors to meet the country's objectives (URT, 2016a, 2017). This is because Tanzania has a comparative advantage in light manufacturing (Dinh and Monga, 2013; AfDB, 2014) and adding value through enhancing processing agricultural products can be a starting point for transforming the economy (Dinh and Monga, 2013; Wangwe et al. 2014).

Nevertheless, despite the significant share of agriculture in Tanzania's total output, further value addition and processing of agricultural goods is still limited (Jahari et al., 2018). The demand for packaged and processed agricultural products is growing signifying a need to move from minimal processing to higher value-added products but the country continues to export raw agricultural commodities while the agro-processing industry cannot meet local demand (URT, 2011). Paremoer (2018) indicated that the country's imports of processed agricultural products will grow far above exports if investments in the sector do not increase. This supports the need for more investments to unleash the potential of the agro-processing sector. However, there is not much knowledge as to the extent to which developing this sector can achieve the economy's growth objectives.

1.3. Research objectives

The study aims to assess:

- The role that agro-processing activities can play in industrialisation and structural transformation of the Tanzanian economy.
- The impact that alternative policies to expand agro-processing have on the sector, and on structural transformation of Tanzania with a specific focus on economic growth and structure, trade, factor and household incomes, and welfare effects.

The study will specifically focus on the impact of policies aimed at:

i. Increasing productivity in agro-processing activities,
ii. Pushing exports of agro-processing activities,
iii. Complementary productivity increase and export expansion in agro-processing,
iv. Increasing the supply of educated labour that is crucial for agro-industrialisation, and
v. Expansion of primary agricultural base to ensure sufficient input supply for agro-processing.

1.4. Research hypothesis

The research hypothesizes that:

- The agro-processing development will be critical for structural transformation of the Tanzanian economy.

- The policy strategies will have different impacts on both the performance of the agro-processing sector and the structural transformation outcomes.

1.5. Method and data

The study made use of literature and secondary data to achieve the set objectives. To address the first objective of the study, a literature review of current and past publications was carried out. The first part of the literature review focussed on understanding the issues of industrialisation and economic transformation and the role of agro-processing and industrial policy in these processes. The second part of the review addressed the Tanzanian context with regards to industrialisation and economic transformation as well as the development of agro-processing.

A computable general equilibrium (CGE), specifically, the IFPRI recursive dynamic general equilibrium model was incorporated to evaluate the impacts of the policy strategies to expand the agro-processing sector. The data to which the model was calibrated is the 2016 Social Accounting Matrix (SAM) developed for Tanzania as part of IFPRI's Nexus Project (Randriamamonjy and Thurlow, 2017). The SAM was aggregated for ease of analysis. A productivity simulation was introduced by accelerating the growth rate of total factor productivity in agro-processing and in agriculture. The export push strategy was implemented as an exogenous shock to the world price of agro-processed commodities while in the education scenario, the growth rate of secondary and tertiary-educated labour was exogenously accelerated.

1.6. Thesis outline

The rest of this thesis is organized as follows. The second chapter reviews literature on economic development focusing on growth and structural transformation and the importance of the broad sectors (agriculture and industry) in the process. The role of agro-processing is also reviewed in this chapter. The chapter also highlights the role of economic policy in the industrialisation process. Chapter 2 will also discuss the related studies as well as the approach to modelling the objectives of the study. The third chapter gives an overview of the economic history and current growth in the Tanzanian economy and identifies the growing need for agro-industrialisation. The fourth chapter focusses on the Tanzanian agro-processing sector, its growth and the current policies to expand the industries. The fifth chapter outlines the methodology and data for the analysis, with the findings presented and discussed in chapter 6, while conclusions and recommendations are drawn in chapter 7.

Chapter 2: Economic Transformation and Industrialisation

2.1. Introduction

The previous chapter highlighted that the Tanzanian government is implementing plans towards industrialisation to ensure economic transformation. This chapter reviews the literature on economic transformation and its relevance and the role that industrialisation plays in the process. The literature also includes discussion on the role that agro-processing activities can play. An analysis is also given on the major part that governments play in promoting industrialisation and the particular aspects that the government must address to support industries in Africa. The chapter will also give a review of past studies related to agro-processing development and structural transformation.

2.2. Growth and Structural transformation

Among the earliest documented insights in economic development is the view that development entails structural transformation (Kuznets, 1966; 1973). Substantial differences in productivity have been observed to exist between the various sectors of the developing economies. Structural transformation is the reallocation of labour and other resources from low productivity to high productivity sectors of the economy (Kuznets, 1973; Aryeetey and Moyo, 2012; Page, 2012; Newman et al., 2016). The dual-sector model by Lewis (1954) provides the mechanism of this structural change. Lewis identified the coexistence of a traditional sector, that is less productive, and a modern sector that is more productive. Investments and ultimately productivity growth would take place in the modern sector and drive growth, pulling excess labour away from the traditional sector. It has long been recognised that labour productivity growth in agriculture was lower than the rest of the other sectors in the economy at low-income levels (Timmer and de Vries, 2009). Thus, structural transformation is viewed as a shift of resources out agriculture (traditional) into "modern" industrial and services sectors. This structural transformation alters the relative importance of the sectors in the economy (Breisinger and Diao., 2008, Herrondorf et al., 2013) and is "both the cause and the effect of economic growth" (Timmer et al., 2012).

Following the observations by Kuznets (1959) and a number of studies (Kuznets, 1966; Chenery 1960, Chenery and Taylor; 1968; Chenery and Syrquin, 1975) in patterns of growth and development, there are interrelated processes of structural transformation that accompany economic development (Breisinger and Diao, 2008). The proponents of the structural transformation hypothesis highlighted that differences might exist in the transformation pathways among different countries (Todaro and Smith, 2015). These differences can be due to initial endowments, policies and institutions (Kuznets, I966; Chenery and Syrquin, 1975; Chenery et al., 1986; Syrquin and Chenery, 1989; Leipziger and Thomas, 1993). However, some stylised facts have been recognised to shape the structural transformation process, and these include:

(1) a declining share of agriculture in the gross domestic product (GDP) and employment,

(2) the rapid process of urbanisation as people migrate from rural to urban areas,

(3) the rise of a modern industrial and service economy, and

(4) a demographic transition from high to low rates of births and deaths (Timmer et al., 2012).

Before transformation takes place, primary agriculture dominates the economy, and the sector contributes a large share in GDP as well as in employment. Such shares can be as high as 50 percent in GDP and 85 percent in employment (World Bank, 2008). As industrialisation[1] progresses, the share of manufacturing in the economy increases and attracts labour away from agriculture. Services will also increase their share in both employment and output, but at a later stage (Binswanger-Mkhizhe, 2010). This reallocation of labour accelerates economic growth (Binswanger-Mkhizhe, 2010). At the beginning of the process, there is a significant gap between the share of labour engaged in agriculture and the sector's share in output (Barret et al., 2017). The share in output falls short of the share in employment (Binswanger-Mkhizhe, 2010). The movement of labour out of the sector raises the sectors' labour productivity. At the end of the process, agricultural productivity would converge with that of the rest of the sectors in the economy, and so does the wages between the sectors. Overall productivity and incomes in the economy will thus increase.

The production structure is also observed to change in the process. Changes in intermediate and final demand, as well as trade, are important aspects of the transformation and industrialisation (Kuznets, I966; Chenery and Syrquin, 1975; Chenery et al., 1986; Syrquin and Chenery, 1989). In the transition process, with regards to final demand, the share of food expenditure in consumption decreases while the share of investment increases. This is consistent with Engel's law which states that as income rises the proportion of income spent on food decreases. On the other hand, intermediate input use increases. With these changes, there is an observed shift of demand from agricultural goods to industrial and service output. The increase in the industry output is due to both increased investment and consumer demand. The proportion of intermediate inputs in total demand as well as their composition will also alter during the transformation process. A decline in the relative use of primary output as intermediates in production while the intermediates from industries and services increase are observed during the process (Chenery, 1963; Chenery et al., 1986; Syrquin, 1988). The use of intermediates not only increases in manufacturing sectors but also in other sectors that use a larger portion of intermediate inputs. Technological changes within a sector can result in more intermediate input use. Agriculture serves as an illustration of a sector that increases manufactured input use with mechanization (Chenery et al., 1986).

[1] Industrialization is a process in which the importance of manufacturing increases and changes are seen in the composition of industrial output and production techniques (Chenery, 1960: p635)

External trade has always played a crucial role in economic growth and structural transformation. At low-income levels, countries rely on capital goods imports to improve their technology and raise productivity. On the other hand, export markets play an important role in boosting local production. The external markets enable growth in domestic production to surpass the local demand growth (Breisinger et al., 2009). The type and composition of traded goods are also observed to change during the transformation process, depending on country size, availability of natural resources, initial factor proportions and economic policies (Syrquin, 1988). An economy generally shifts from primary exports to manufactured exports as it transitions into a more developed economy. A country mainly specializes according to domestic demand which is a source of comparative advantage (Linder, 1961) and thus the common technique is import substitution of manufactured imports. Mainly countries start with the production of low-tech manufactures that are relatively labour-intensive and later switch on to high-tech manufactures that are more capital-intensive. It is important to note that macroeconomic trade policies can influence the pace and direction of transformation (Chenery et al., 1986; Syrquin, 1988).

2.2.1. The relevance of Economic transformation

According to Timmer et al. (2012), structural transformation is still a relevant feature of economic development. Successful, rich, countries managed to diversify away from agriculture (Lin, 2011; McMillan et al., 2014). In countries where structural change does not take place, poverty remains, and efforts for sustainable poverty reduction will not be fruitful (Lavopa and Szirmai, 2012). This is mainly because productivity has been found to be the lowest in agriculture in low-income countries (Chenery et al., 1986; McMillan et al., 2014; Gollin et al., 2014) and reallocation of labour into the non-agricultural sectors would result in dramatic rises in income (McMillan, 2011). Poor and rich countries are differentiated by the nature and speed of structural transformation (Timmer, 2009; Lin, 2011; McMillan and Rodrick, 2011; Szirmai, 2012). The faster the rate of transfer of labour from traditional and informal sectors to more dynamic industrial sectors, the faster will be the rate of growth of the economy (Rodrik, 2006).

2.3. The role of agriculture

The role of agriculture in development has been subject to debate since the eighteenth century (Timmer, 1988). The observed decline of the sector's contribution resulted in earlier economists assuming a less important role of the sector in economic development. Following the works of Lewis (1954) and Ranis and Fei (1961), agriculture was seen to play a passive role in contributing food, labour and capital in economic and industrial growth. Schultz (1953), however, changed the view when he highlighted the need for modernizing the sector as an important element to growth. He emphasized the need for incentives for farmers to adopt modern technologies to raise agricultural productivity for the sector to drive economic growth. The Green Revolution in Asia further reinforced this view. Agricultural transformation has been regarded as a key driver of the broad structural transformation process.

"Agricultural transformation is a process whereby an agri-food system transitions, over time, from being subsistence-oriented and farm-centred into one that is more commercialized, productive, and off-farm centred" (Jayne et al., 2018). During early stages in the transformation of an agri-food system, on-farm productivity rises. The increased farm incomes from this productivity growth generate demand for nonfarm goods and services in the broader economy. Farmers may diversify from staple crops to higher-value crops and livestock, they may diversify to earning more off-farm income, or they may leave farming altogether for better economic opportunities elsewhere. This is how labour is released into the industry. Agriculture supplies the resources needed for the broad economic transformation. The increased incomes in agriculture are the source of savings that result in capital accumulation which stimulates the growth process. Johnston and Mellor (1961) highlighted that agriculture has five roles in economic development which are supplying of food, earning foreign exchange, source of capital, source of labour and provides market linkages between the sector and rest of the economy. With the emphasis on poverty reduction as part of economic development, the World Bank (2008) added poverty reduction to the traditional roles of agriculture in development.

The critical role of agriculture raises a question on the importance of the non-agricultural or industrial sectors. The agricultural revolution entails increasing productivity within the sector, but between sectors productivity increases by moving labour out of agriculture which will result in convergence of the sector's productivity with the rest of the economy. Developing the sector alone will result in fruitless efforts. The off-farm sector has to be developed, and labour markets have to be functional to encourage the shift of labour out of the sector. A study on Malawi by Darko et al. (2018) found that increasing agricultural productivity is necessary but not enough for poverty reduction and welfare gains. The implication thereof is that efforts to improve the lives of the rural agricultural households should go beyond productivity improvements in the sector to consideration of the off-farm rural sector (Darko et al., 2018). Badiane and Makombe (2014) highlighted that there is a need to raise both labour productivity in agriculture and at the same time diversifying into high-valued goods outside agriculture, particularly manufacturing and services. The ability of agriculture to transform and lead the structural transformation process will remain limited if the industry is not growing (Mukasa et al., 2017).

2.4. The importance of industrialisation (manufacturing)

Though agriculture plays a crucial role in the development process as highlighted above, industrialisation has been associated with nearly all cases of countries that have attained and maintained rapid growth and high standards of living (Haraguchi et al., 2017; Szirmai, 2009). Industrialisation, manufacturing, in particular, is regarded as the engine of economic development (Wells and Thirlwall, 2003; Thirwall, 1983; Lavopa and Szirmai, 2012; Lavopa, 2015; Haraguchi et al., 2017; ECA, 2016). This is following Kaldor's laws which can be summarized by Thirwall (1983) stating a correlation exists between growth in manufacturing output and growth of the economy, with causality from the latter to the former. There is some empirical evidence supporting manufacturing as an engine

of growth (Wells and Thirlwall, 2003; Millin and Nichola, 2005; Marconi et al., 2016). In developing countries, manufacturing share in GDP (Rodrick, 2009; Lavopa, 2015; Szirmai and Verspargen, 2015) and the share of manufactured inputs in various sectoral production (Szirmai, 2012) are found to bring a positive impact on total output growth. Lavopa (2015) also highlights that there is a positive relationship between the share of manufactured products in total exports and economic growth.

The argument for industrialisation is centred around structural change. As mentioned earlier, productivity in industrial sectors is found to be higher than in the agricultural sectors. The reallocation of resources from agriculture into manufacturing will thus result in static and dynamic rise in overall productivity and per capita incomes in the economy (Chenery et al., 1986; Lavopa and Szirmai, 2012). Empirical evidence shows that this structural change bonus is a major driver of growth in developing countries (Timmer and de Vries, 2009). Due to higher productivity and labour-intensity at early stages of development, expansion of manufacturing can absorb more labour in the sector. Directly, manufacturing is often associated with quality jobs (Lavopa and Szirmai, 2012). Indirectly, the strong linkages of the manufacturing sector to the rest of the economy can stimulate expansion of other sectors which in turn creates jobs in these sectors (Lavopa and Szirmai, 2012). Manufacturing has traditionally absorbed a large base of the unskilled labour force as compared to other high productivity sectors such as mining and finance (Rodrik, 2016b).

Szirmai (2012) argues that the industrial sectors – which include mining, utilities and manufacturing - offer better opportunities for scale economies than the agricultural and service sectors. Manufacturing exhibits static and dynamic increasing returns to scale (Kaldor, 1966). Static economies of scale are associated with specialization, size and scale of production (Lavopa, 2015; Haraguchi et al., 2017;). On the other hand, dynamic economies of scale refer to learning by doing effects, induced technological change and external economies (Lavopa, 2015; Marconi et al., 2016). Increasing returns to scale will result in cost reductions in production (Thirwall, 2002).

Manufacturing is also credited for its potential for capital accumulation in developing countries. The spatial concentration of these activities presents greater opportunities for accumulation of capital and capital intensification than agricultural activities that are spatially dispersed. However, this role of manufacturing is observed to decline as the economy becomes more developed (Szirmai, 2012). As highlighted in the previous sections, capital accumulation is an important source of growth. In addition, industrialisation also allows for technological progress through accumulation of new capital goods (Cornwall, 1977). Chenery et al. (1986) highlighted that agricultural production is limited by technology in early stages of structural transformation but as industrialisation progresses the total factor productivity rises. This highlights the importance of manufacturing in technological spillovers that manufacturing exhibits (Lavopa and Szirmai, 2012; Szirmai, 2012). Another important attribute found in the study of Lavopa and Szirmai (2012) is that manufacturing firms have the highest share in research

and development expenditures. Faster technology adoption and innovation raise aggregate labour productivity and reduce prices, which raises real incomes and profits that allow faster investment (Balchin et al., 2016).

Manufacturing activities are also considered to possess strong linkages with the rest of the economy (Hirschman, 1958) and their expansion can thus stimulate investment in other sectors as well as diffusion of knowledge to other sectors (Haraguchi et al., 2017; Szirmai and Verspagen, 2015). Manufactured products have a higher income elasticity of demand as compared to primary products of agriculture (Chenery et al., 1986). Thus, unlike for the majority of agricultural products, the demand for manufactured products will rise as per capita incomes increase. This implies that growth is often limited as income increases in countries that specialize in agricultural products (Haraguchi et al., 2017). This higher income elasticity of demand is of importance with regards to exports. Export incomes play an important role in lessening the burden that the balance of payments imposes on an economy's growth (Chenery et al.; 1986; Szirmai, 2012; Lavopa, 2015). Manufacturing is also vital for transforming non-tradable agricultural products into tradable products (Chenery et al., 1986) as will be explained at a later section on agro-processing. Manufactured goods have higher substitutability and can play a role in import substitution in the domestic market, which also lightens the restrictions of balance of payments on growth (Chenery et al., 1986; Lavopa and Szirmai, 2012). Manufacturing is also commented for cushioning the economy against external shocks as it transforms the commodities which are mainly affected by these shocks. This is an advantage also to the poor who mainly feel the impact of the shocks.

2.5. Is industrialisation still relevant?

Emphasis on industrialisation has been mainly on manufacturing, particularly smokestack (factories) industries. An observed pattern in the 20th century is that the contribution of manufacturing tends to decline at high levels of income. In the long run, services output would grow faster than the rate of manufacturing growth even though productivity growth in manufacturing would still be high. The ultimate result would be a shift in employment to the service sector. This secular decline in manufacturing employment shares is known as deindustrialisation (Tregenna, 2011). This was viewed as an indicator of successful transformation (Rowthorn and Ramaswamy, 1997).

Recently, manufacturing shares have been observed to decline even in low-income countries that have not experienced much industrialisation. Rodrik (2016b) terms this phenomenon premature de-industrialisation. The role of manufacturing as an engine of growth has become questionable due to premature deindustrialisation. A recent study by Haraguchi et al. (2017) concluded that manufacturing has not lost its position as a growth engine. They highlighted that the observed premature de-industrialisation is due to a concentration of manufacturing activities in a few developing countries, mainly Asia, thus impeding development in other countries. Lavopa and Szirmai (2012) maintain that

while services can be new engines of growth the role of manufacturing as a growth engine has not changed and thus the sector should be accorded priority in policy debates.

Page (2011; 2012) and Stiglitz (2018) highlight that the changes in the global economy will require developing countries to consider not only smokestack but also industries without smokestacks. Agro-industries fall among industries without smokestacks (Page, 2011) which the government of Tanzania aims to expand. The following section discusses the role that agro-processing can play.

2.6. The agro-processing industry's role

Agro-processing comprises of manufacturing activities that transform raw materials and intermediate products from agriculture, forestry and fisheries (FAO, 1997). The sector thus includes the manufacturing of food, beverages and tobacco, textiles, clothing, leather, footwear, wood products, paper and paper products, rubber products and furniture products. Agro-processing served as the entry point to industrialisation for the majority of modern-day industrialised countries. Expanding agro-processing has a positive impact on human development (Wilkinson and Rocha, 2009). The industry is important in the creation of employment and incomes and as a strategy for pro-poor growth in the rural economies.

In developing and transitioning countries, agro-processing activities dominate the manufacturing sector. These activities contribute 52 percent, 36 percent and 32 percent of total value-added of manufacturing in low-, middle-, and upper-middle-income countries, respectively. Their contribution can be even higher in agro-based countries. In addition, about 4-5 percent of the total value-added in the low and middle-income countries is from agro-processing. Thus, agro-processing has a vital role in contributing to the output of the economy. Agro-processed products also make a significant part of these countries' exports (Wilkinson and Rocha, 2009).

Agro-processing industries, particularly small-scale processors in Africa (Woldemichael et al., 2017), are often located close to their source of raw materials (Henson and Cranfield, 2008). Due to their labour-intensive nature, especially at early stages, the activities thus provide employment and incomes to a large rural population (Yumkella et al., 2011). The rural-based workforce is often with low skills and remains stuck in less productive subsistence agriculture (Briones and Felipe, 2013; Figueroa et al., 2018) and the informal sectors, limiting rapid growth and transformation (Collier and Dercon, 2014; McMillan et al., 2014). However, the more productive processing activities (Wilkinson and Rocha, 2009) which offer better wages and benefits (McMillan and Headey, 2014) can absorb a significant number of less and semi-skilled labour (Yumkella et al., 2011). For example, the South African food industry employs 46 percent semi- and unskilled labour, 40.3 percent mid-level skills and only 7.1 percent high-level skills (Gebrehiwet, 2012). A lot of women are also gainfully employed in processing activities (Woldemichael et al., 2017). Expanding processing can thus generate better jobs and incomes, and

encourage productivity increases by the movement of labour out of agriculture. Though agro-processing subsectors are heterogeneous in terms of productivity, generally labour productivity is higher in agro-processing than the manufacturing averages (Wilkinson and Rocha, 2009). Specifically, productivity in food processing is very high (Wilkinson and Rocha, 2009; FAO, 2017). Combined with its labour-intensive nature (FAO, 2017) food processing presents a huge employment generation opportunity in the rural areas in low-income countries (Wilkinson and Rocha, 2009; FAO, 2017).

The rural population constitutes most of the poor. Pro-poor growth is enabled if economic growth and development are brought to rural areas (Henson and Cranfield, 2008) and is led by labour-intensive sectors (Loayza and Raddatz, 2010; El-Enbaby et al., 2016) which is the case of the agro-industry. However, some industries producing high-value products locate close to their markets (Henson and Cranfield, 2008). They thus help the low skilled and poor migrants with wage employment, reducing urban poverty which is increasing in Africa (Ravallion et al., 2007).

The Hirschman (1958) unbalanced growth strategy of choosing key sectors with strong interdependence with others is another argument for the agro-industry. As summarised by Yotopoulos and Nugent (1973) and FAO (1997) the strategy entails focussing investments in 'non-primary' activities that utilises substantial amounts of raw materials and intermediate inputs from other sectors (backward linkages) and also to 'non-final' activities whose output would be utilised as inputs and induce production for other sectors (forward linkages). This would induce private investments in other sectors and thus expansion of various sectors.

The development of agro-processing activities is driven by the need to capture the strong backward and forward production linkages between the sector and the rest of the economy (FAO, 1997; Ehui and Delgado, 1999; Da Silva et al., 2009; DTI, 2017). For example, backward linkages are formed with the primary agricultural activities which supply raw and intermediate inputs for processing, and with other input suppliers such as machinery, electricity and financial service providers. Examples of forward linkages include food service sectors that use processed products as intermediate inputs and the retail and transport services which can also be part of the rural activities of the poor. Agriculture can also benefit when activities such as milling, on the other hand, provide feed for animals. Expansion of the processing industry thus supports the expansion of other industries; it induces investments, output and employment growth in other sectors. In developing countries, for every single job created in agro-processing, about 2.8 jobs are created somewhere else in the economy (Infodev, 2018).

The linkages between agriculture and processing are very important. Agro-processing industries expand the market and the demand for agricultural produce and thus 'pulls up' agricultural production (Watanabe et al., 2009; Wilkinson and Rocha, 2009; Nkechi and Lambon-Quayefio, 2017). This provides incentives for commercialization of agriculture which is important for structural transformation (Collier

and Dercon, 2014). The need to meet the increased demand results in the adoption of modern technologies which in turn increases productivity and therefore farm incomes, the total effect of which is poverty alleviation among the rural poor (Wilkinson and Rocha, 2009). On the other hand, commercialization is encouraged by transforming agriculture's non-tradable products into tradable products through processing (Ehui and Delgado, 1999). Processing adds value and ensures higher prices. Processing also reduces post-harvest losses which are prevalent in Africa, creating value from what might have been lost to spoilage and can even add nutritional value to food (Nkechi and Lambon-Quayefio, 2017; Infodev, 2018). Processed foods also have stable prices compared to primary agricultural products, benefiting those that depend on wage employment (Ehui and Delgado, 1999; Nkechi and Lambon-Quayefio, 2017).

2.7. Industrial policy

Successful industrialisation, and consequently structural transformation, is not an automatic process. The need for a dynamic private sector, and efficient markets that provide the right signals for the firms to make the right investments (Lin and Chang, 2009; Lin and Monga, 2010) cannot be underestimated. Nevertheless, previous experiences depict that governments in high-income countries played an active role in the industrialisation process (Lin and Chang, 2009; Lin and Monga, 2010). Lin and Chang (2009) maintain that when proper government actions to promote industrialisation are taken, they can induce and support long-run sustained improvements in factors and productivity. Many thus view industrial policy as an important ingredient in structural transformation (Aryeetey and Moyo, 2012). Nevertheless, the majority of developing country governments made several attempts to facilitate industrialisation and failed and thus the role of government or industrial policy is subject to debate (Aryeetey and Moyo, 2012). Rodrik (2009) argues that the debate should rather not be whether to implement industrial policy but rather on how to design and implement it.

From a neoclassical perspective, the government's role is to maintain macroeconomic stability and enhance the efficiency of markets, that is, to correct market failures (Lall, 2004; Mogues et al., 2012) that block innovation in the industry. Such market failures include, among others, under-provision of public goods, information externalities and coordination failures (Lin and Chang, 2009; Lin and Monga, 2010; Aryeetey and Moyo, 2012). Technological innovations are associated with information externalities which result in first movers absorbing higher costs for the innovations thus discouraging investments. A common strategy that governments have implemented is subsidising the first movers (Lin, 2011). Also, for most private sector projects to succeed, there is a need for complementary parallel investments in human capital, financial and legal institutions, as well as in infrastructure (Pack and Saggi, 2006; Lin and Monga, 2010). Individual firms cannot be able to carry out these required complementary investments, and efforts for coordination among the firms to bring about the changes are often improbable. The government will, therefore, intervene in this case either by making the required investments or coordinating them (Lin and Chang, 2009). Neoclassicals thus advocate for governments

to foster horizontal policies aimed at improving the overall business environment to attract private investments rather than choosing specific industries.

Governments, however, also implement vertical policies which are policies targeted at developing specific sectors when it is deemed the market cannot do so. However, these policies are often as associated with the picking of winners (Aryeetey and Moyo, 2012) and prioritizing the development of those sectors. The ability of the government in choosing the right sectors for support is, however, often questionable (Zhang and Hu, 2014). Besides, this contrasts with the work by Roseinstein-Rodan (1943) and Nurkse (1953), among others, who advocated for a big push or balanced growth strategy. Under this strategy, the state must coordinate the expansion of various sectors of the economy simultaneously as they are interdependent (Murphy et al., 1989). Nevertheless, resource constraints in developing countries often lead to prioritization (Arteetey and Moyo, 2012) and rather an unbalanced growth strategy (Hirschman, 1958) where winners are picked. Wade (2010) also argues that general horizontal policies might not address sector-specific constraints signifying the need for vertical policies.

Vertical policies can include the provision of incentives to stimulate investments in, as well as protection of the targeted sectors (Arteetey and Moyo, 2012). Developed countries implemented import substitution policies to promote their manufacturing industries during their growth stages (Zhang and Hu, 2014; Rodrik, 2016a). Industries are protected by charging tariffs on the competing imports. Criticism on such policies has arisen on the fact that they are distortionary (Zhang and Hu, 2014) but the need to support local infant industries often counter this argument. Incentives can range from providing subsidies to production of certain goods, offering tax holidays to new and expanding firms and tariff incentives for firms that want to import inputs and modern technologies for the production of targeted industrial goods. The incentives can also be targeted to expand industrial exports by subsidising exporting firms. Targeting FDIs to the priority sectors is also important. Encouraging FDIs to invest in local firms not only secures required finances for the business but also encourages technology transfers and information sharing (Brautigam and Tang, 2014).

Arteey and Moyo (2012) conclude that successful industrialisation has always been a combination of both horizontal and vertical policies. The goal of all industrial policies should, however, be to ensure macroeconomic stability and encourage private sector-led development. Lin (2011) suggests that countries must support industries in which they have a comparative advantage and make them competitive. The defying of comparative advantage is costly. In developing countries where there is a lack of human and physical capital but rather an abundance of natural resources and unskilled labour, the comparative advantage is thus in labour-intensive and resource-intensive sectors (Lin and Chang, 2009; Aryeetey and Moyo, 2012). When a country supports industries in which its comparative advantage lies, the industries will be competitive both locally and globally. This will encourage

innovation and diversification as well as upgrading of the industrial structure (Lin and Chang, 2009; Lin and Monga, 2010; Lin, 2011).

2.7.1. Prospects for Industrial Policy in Africa

Arteetey and Moyo (2012) highlight that there is no specific policy that can suit and be adopted by all countries. African countries will, therefore, need to experiment with both horizontal and vertical policies. Page and Tarp (2017) argue that success in East Asia was partly as a result of governments' willingness to experiment and respond to changing circumstances. Generally, the poor business environment which raises the cost of doing business has been highlighted in various studies as a major obstacle to industrial development in Africa (Page, 2012; Gelb et al., 2014; Page and Shimeles, 2014; Rodrik, 2016a). Gelb et al. (2014) point poor infrastructure, particularly power and transport networks, as the major impediment. These factors increase the costs of doing business on the continent and have a negative effect on productivity and thus competitiveness. A study by Harrison et al. (2014) found that African firms exhibit poorer performance than firms in other regions mainly because of limited access to finance, infrastructure bottlenecks and political monopoly. When they controlled for these factors, Africa exhibited a conditional advantage in productivity. Success in industrialisation would thus require closing the infrastructure gap.

Johnson et al. (2007) and Rodrik (2016a) suggest that an exchange rate policy can be an alternative policy to stimulate growth of tradable goods in the presence of high costs of doing business imposed by poor infrastructure. Devaluing the exchange rate would act as a subsidy for trading firms. Undervaluation encourages a country to diversify away from commodity dependence and expand manufacturing exports (Johnson et al., 2007). Rodrik (2016a), however, argues that the effectiveness of this sound policy will rely on appropriate monetary policies such as regulation of capital and aid inflows. He maintains that these macroeconomic policies might be easier to implement than policies needed to address the various individual issues which are collectively termed as ‘poor business climate’. Nevertheless, since the adoption of the Washington consensus policies, the devaluation is unlikely to be adopted by the African governments.

African governments should also ensure access to finances for ventures, especially in the agro-industry. The South African government is currently implementing this process, and it has been beneficial in expanding the industry and retaining and creating additional employment. Perhaps this strategy can be limited by the availability of funds across the poor African countries.

Another challenge faced in Africa is skill shortages. Education and skills are necessary ingredients of productivity and job creation (World Bank, 2014). In addition, firms with high level of skilled and educated labour and management tend to export more (World Bank, 2014). There is a mismatch between African graduate skills and the skills needed in the industry (Page, 2011).

Page (2011; 2012; 2016) highlights that government support for the industry will need to go beyond focusing on the investment climate and adopt strategies aimed at breaking into the global markets. He emphasizes that public policies should be geared towards export push strategies, building and attracting firm capabilities, and supporting agglomerations. Export push strategies include improving trade logistics, diversifying markets for non-traditional exports, improving trade policies and encouraging regional integration. Encouraging industrial agglomerations can be done through Special Economic Zones (SEZ) where there is a concentration of investments in infrastructure and high-quality institutions. The aim is to build industrial clusters as productivity gains are realised when firms cluster. Zhang and Hu (2014) highlight the success story of cluster-based development in China.

For the agro-industry to drive growth and transformation, there is a need to ensure that smallholder farmers are integrated in the process. These farmers are often excluded because they fail to meet the required volumes and quality needed by the processors, especially for foreign direct investments (FDIs). This challenge can be addressed through two complementary strategies. First, incentives for agro-processing should be location-based and second, policies or institutions (for example, encouraging farmer associations or cooperatives) should be put forward to make sure that the processors will buy from local farmers and incorporate them into the value chain. Zhang and Hu (2014) documented a successful story in China where policies and incentives were location-specific (cluster-based) and how government intervened to set up local farmer trade associations that bargained with processors instead of each farmer dealing with the agro-processors. Basically, the local government of the identified area for development can help small-scale farmers to establish a trade association and help them to build skills in production, marketing and purchasing.

The government can then make deals such as the tax holidays and tariff incentives for agro-processors that first move into the area and make contractual arrangements with the trade association. All deals between the agro-processors and farmers will be through the trade association. This reduces transaction costs. The farmer trade associations can bargain for contracts in which they are provided with inputs upfront as well as finances for production and only pay back later at harvest. Contracting basically result in the integration of the value chain. The government and the agro-processors will jointly work together to ensure the required production and quality. This way, promoting agro-processing can ensure pro-poor growth.

2.8. Further arguments for agro-processing in Africa

As mentioned by Lin and Monga (2010), the endowment structure of an economy differs at every stage of development and thus provides a guideline of the industrial structure based on pursuit of comparative advantage. Because of their endowment structure, African economies, therefore, have potential in labour-intensive and resource-based light manufacturing industries (Dinh et al., 2012; Dinh and Monga, 2013). Agro-processing activities are part of these light manufacturing activities. The study

by Harrison et al. (2014) also showed that Africa's conditional advantage in productivity was higher in low-tech than high-tech manufactures and in manufacturing than in services.

The majority of the SSA region's economies are experiencing growth in incomes. The continent's middle class is therefore rising, and urbanization is also spreading. With the increase in wage employment in cities and increase in incomes, consumers shift from high consumption of staples and starchy foods to more high value, processed and healthier foods (Wilkinson and Rocha, 2009; da Silva et al., 2009). The rising demand in urban food markets creates a real opportunity for industrialisation based on agribusiness (Badiane, 2012). Thus, there is a strong need for an increase in the value addition of agricultural produce to meet the growing demand for convenience or processed foods and other high-value products (BFAP, 2017). With the projected increase in population as well as growth in incomes, there is a strong incentive to promote agro-processing in the region. There are opportunities of a growing regional market for any SSA country that establishes its agro-processing to meet both its domestic and export requirements for processed food. In addition, labour is in abundance not only in rural areas but also in urban areas where the majority of the young working-age move in search of better opportunities.

2.9. Modelling agro-processing expansion and structural transformation

The outcome of policy strategies on sectoral and overall economic performance can be analysed either in a partial equilibrium or general equilibrium model. Partial equilibrium analysis examines a single market at a given point in time in isolation from other markets. Thus, this approach considers the direct effects of policy in one market without considering the indirect and feedback effects that might concurrently take place in interrelated markets. On the other hand, general equilibrium analysis examines the general relationship of supply and demand of the various markets in the economy concurrently. General equilibrium analysis ascertains that no single market exists in isolation but rather the markets in the economy are interrelated and thus the simultaneous analysis of the various markets' forces. Whenever relative prices matter, the appropriate modelling framework is general equilibrium (Britz and Roson, 2018).

As highlighted previously, an important aspect underpinning the importance of agro-processing in economic growth and structural transformation is its linkages with the rest of the economy. In addition, structural transformation is basically a general equilibrium issue as it involves interrelated processes within the economy and interaction between the various sectors of the economy. In this regard, a general equilibrium model is more appropriate for this study. A computable general equilibrium model is used for this study.

2.9.1. Background of Computable General Equilibrium Models

CGE models have their basis on the neoclassical general equilibrium theory (Devarajan and Robinson, 2013). The models are based on the Walrasian general equilibrium (Robinson and Rolland-Holst, 1988). In Walrasian equilibrium, it is assumed that buyers and sellers in the market are numerous and take prices as given. These economic agents are so small such that each individual cannot influence the price system and thus the decision of one individual will not influence the other agent's (Hildenbrand, 1970).

There are different types of CGE models. These models are generally grouped based on their time-frame coverage into static, dynamic (intertemporal) or recursive dynamic; and /or based on their geographical coverage into, for example, single country, regional or global (Punt, 2013). Devarajan and Robinson (2013) describes the static model as a 'neoclassical Arrow–Debreu general equilibrium model that incorporates only flow equilibria in product and factor markets and solves only for relative prices'. In this model, agents are assumed to be myopic as they make decisions only for the current period.

The recursive dynamic model has both a "within-period" (static) and a "between-period" component in which exogenous parameters in the static module are updated and some adaptive expectation specified. However, there are no forward-looking expectations among agents. The dynamic (intertemporal) models, on the other hand, are built on the assumption that agents have perfect foresight and hence forward-looking expectation. Lofgren and Robinson (2008) highlight that the recursive dynamic models are widely used in policy analysis while the intertemporal models, which can be solved analytically, are more important for literature.

In this study, a recursive dynamic computable general equilibrium will be applied. The model will be influential in examining the inter-linkages between the agro-processing sectors with the rest of the economy. The model applied to this study is consistent with the neoclassical-structural theory and is based on the IFPRI standard model developed by Lofgren et al. (2002). It is a recursive dynamic CGE, implying that decision-making by economic agents is based on the past and prevailing market conditions - there are no future expectations involved in decision making as in intertemporal models (Diao and Thurlow, 2012). The model is expressed as a system of simultaneous linear and non-linear equations. At any given time, these equations present the structure of the economy and capture the circular flow payments or the behaviour of the economic agents with regards to production, consumption, investment and trade, and include government revenues and expenditures (Lofgren and Robinson, 2008). The economic environment governing agents' behaviour is expressed in the form of equilibrium conditions, macroeconomic balances and dynamic updating equations (Lofgren and Robinson, 2008; Thurlow, 2008).

2.9.2. The motivation for using CGE

CGE models are explicit in recognising the economy-wide effects of changes or shocks in one sector of the economy and capture direct and indirect effects of policy reform changes (Lofgren and El-said, 1999). They are thus preferable over econometric or partial equilibrium models as they overcome the difficulty of isolating the effects of individual policies from other changes in policies and external factors.

CGE models also have much depth on institutional and sectoral characteristics which are essential for detailed policy analysis (Thurlow, 2004; 2008). The dynamic CGE models also allow for the observation of the potential trade-offs of policies over time. They are especially useful in examining the impacts of investments which take longer to be recognised. The recursive model is also best suited for this study because static model results are often biased on large sectors in the economy and tend to neglect structural change (Lavopa and Szirmai, 2012). The model will be influential in examining the inter-linkages between the agro-processing sector with the rest of the economy and the direct and indirect effects of policies to promote this sector. The model also incorporates household data making it suitable for analysis of the impact of the policy reforms on household incomes and welfare.

CGE models are however considered to be technically demanding and data intensive. In addition, the structural parameters that are input to the model are difficult to estimate. This compels researchers to borrow estimates from past studies done in other countries. This makes the CGE comparable to cross country regressions (Wilhelm and Fiestas, 2005).

2.10. Related studies

Ehui and Delgado (1999) implemented a static CGE (GTAP) model to assess the impacts of technology in agriculture and the related processing sectors in Africa. They analysed different forms of technical change over the agro-processing sector and also compared the effects of productivity increases in agro-processing against increases in primary agriculture. The study also found that labour-using rather than labour-augmenting technical change in processing activities had superior domestic welfare gains. Technical change in processing activities was also found to reduce exports of raw agricultural products in favour of processed food exports. The analysis also found that productivity increases in primary sectors had the most impact on welfare and led to significant diversification away from agriculture. The study did not, however, account for the costs of increasing productivity.

Breisinger et al. (2009) and Diao (2010) modelled different sector-specific growth options and their impact on structural change in the Ghanaian economy over 10 years using a recursive dynamic CGE model. A comparison was made between accelerated growth emanating from productivity improvements in the industry, services, agriculture export sectors and other agricultural sectors. Their findings suggested that Ghana's growth path would be one in which all sectors are driving the transformation process. In addition, both studies found that industrial-led growth through productivity

improvements would reduce raw material exports and improve the country's export structure. However, agriculture-related industries would be constrained by their dependence on agricultural growth for inputs. In addition, the agro-processing sectors which are mainly domestic-oriented would also be affected by the local market (incomes) whose growth is limited if agricultural growth is slow. This suggested the need for agricultural expansion to support the industry. However, the presence of export markets can make a difference in the outcomes, which previous studies have not explored.

Dorosh and Thurlow (2014) also employed a recursive dynamic CGE to study the debate between agriculture versus non-agriculture growth in SSA by estimating sectoral poverty–growth elasticities (PGEs) in five African countries including Tanzania. In their study, they disaggregated the non-agricultural sector into subsectors. The study found poverty-growth elasticities of manufacturing (agro-processing) closer to those in agriculture in Malawi and Tanzania and even higher than those in agriculture in Zambia. The PGEs for Tanzania were found to be -0.89, -0.69 and -0.72 for agriculture, manufacturing and agro-processing respectively. The study did not, however, disaggregate the agro-processing sector.

A recent study by Fukase and Martin (2017), focussing on trade, employed a static GTAP model to evaluate the impact of increasing productivity in the food processing industries of African countries, including Tanzania. The study found that exports of processed food increased while imports decreased. Exports by other industries declined. However, the study understated the long-run impacts of productivity increases, and also the costs of bringing about the productivity gains (Fukase and Martin 2017).

Diao and Thurlow (2012) concluded from their study of the impacts of raising productivity in the agricultural sector that the growth of some primary activities in Tanzania may be limited due to the lack of downstream processing capacity. To this author's knowledge, however, there are no empirical studies that have evaluated the economy-wide impacts of developing the agro-processing sector in Tanzania to examine the impacts on growth, trade, incomes, and household welfare. In addition, the impacts of increasing educated labour as part of industrial development have not yet been exploited. To add, the previous studies did not explore the impact of expanding export markets on agro-processing expansion. Hence the purpose of this study is to fill that gap.

2.11. The database – A Social Accounting Matrix

CGE models are calibrated to datasets known as social accounting matrices (SAMs). A SAM is an accounting system that captures all the transactions in an economy in a table format (Pyatt, 1988). The basic SAM used as the database for the CGE models basically has production accounts (activities) which represent industries, commodity accounts representing goods and services in the commodity market, institutions accounts, factor accounts, savings and stock changes accounts and the rest of the world. The

underlying principle behind the SAM construction is that of the circular flow in the economy. The circular flow is an economic model that illustrates the exchanges (flow) of money for goods, and services between the economy's institutions (government, firms, and households) as well the exchanges between the economy and the rest of the world. Since the circular flow is developed on the fundamental principle that for every income there is a corresponding expenditure, the SAM is a square matrix with the same number of rows and columns (Pyatt, 1988) showing the receipts across the rows and payments down the columns. As explained by Punt (2013), the circular flow model has goods and services flowing in one direction while money flows in the opposite direction.

Within the economy, institutions sell their factors of production (land, labour and capital) in the factor markets to the industries which produce goods and services and sell them in product markets, either as intermediate inputs of production to other industries or as final goods to the institutions. Institutions receive income (e.g. salaries, wages, rent) from industries as factor payments and will spend it on goods and services in the product markets. Savings can also occur. The economy can also interact with the rest of the world (ROW) through the product markets and can export and import products. Institutions can also provide factors of production, for example, labour, to the ROW and get income in return. Likewise, other countries can also provide some factor services to the economy and get factor income transfers in return.

2.12. Conclusion

Structural or economic transformation is a defining feature of economic development. Economic transformation results in convergence in productivity among the traditional and modern sectors of the developing economies, leading to economy-wide gains in productivity and incomes. In countries where this process does not take place, socio-economic challenges prevail. Industries, particularly manufacturing, have always played a greater role in structural transformation by absorbing labour out of the low productive subsistence agricultural sectors. Historical evidence shows that virtually all successful countries managed to industrialise. Thus, there is a need for industrialisation in Africa.

In times past, industrialisation has always been associated with factories. Agro-processing activities, however, present an opportunity for diversification of the economy especially considering the current contribution of agriculture in African economies. In addition, the growing regional demand for processed products signifies the need to expand agro-processing industries. Successful industrialisation will, however, rely on sound industrial policies that entail both horizontal and vertical policies. However, there is a need to explore the outcomes of the various policies. Currently, there is a paucity of empirical evidence on the economy-wide impacts of the alternative policy strategies to expand the agro-processing sector in Tanzania. This study aims to fill the gap through policy simulation analysis using a dynamic computable general equilibrium that is best suited for such analysis as it allows the effects of policies to be examined over time.

Chapter 3: Overview of the Tanzanian Economy

3.1. Introduction

In the current development plans, the agro-processing industry is accorded high priority. This chapter views the prevailing socio-economic conditions and the viable opportunities by which the country can bring about the much-needed transformation. This will shed light on the importance of agro-processing to the economy. The rest of the chapter is organized as follows. Following the introduction, section 2 highlights the current growth trajectory in Tanzania and contrasts it with the previous performance of the economy. The third section discusses the drivers of the recent growth in Tanzania. The status of economic transformation is discussed in the fourth section and the fifth section is analysis of the recent developments. This analysis is followed by a discussion of the future pathways to accelerate the development of the economy and finally a conclusion is drawn.

3.2. The recent economic growth trajectory

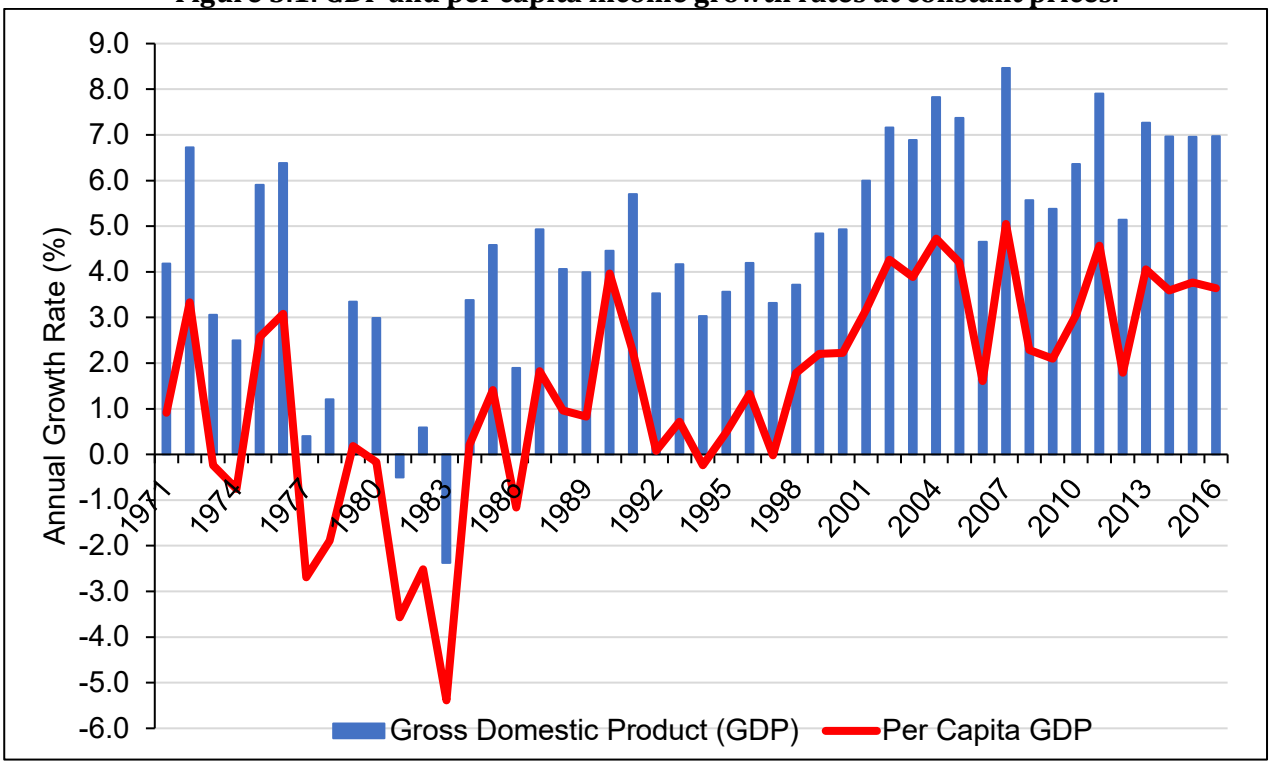
Following several years of poor economic performance, the Tanzanian economy has experienced high growth since the mid-1990s and has become a leader in the African growth miracle (Page, 2016). Between 2000 and 2016, Tanzanian GDP grew at an average of 6.5 percent per annum, a growth rate far above that of the SSA region (Andreoni, 2017). Growth in GDP per capita (Figure 3.1) is, however, not as high owing to the rapidly growing population in the country. However, this per capita growth is also higher than the region's average.

Robinson et al. (2011) note that the economic performance of virtually all low-income economies exhibits recurring periods of growth, stagnation, and decline (Pritchett, 2000) even under the same policies and country conditions (Easterly et al., 1993). Economic growth in Tanzania before the mid-1990s followed such a trajectory with short-lived periods of acceleration. In contrast, the current growth in Tanzania has been sustained over a more extended period (Figure 3.1). The economy has exhibited some resilience against negative shocks (World Bank, 2015) which include unfavourable climatic conditions for agriculture (in 2006 and 2012) and the global financial crisis.

Despite the rapid economic growth over the past years, poverty is still very high in Tanzania and progress in poverty reduction has been disappointing (Pauw et al., 2018; Mashindano and Maro, 2011; World Bank, 2013; ECA, 2015). The national poverty indicators (Table 3.1) show that the percentage of the population living below the basic needs poverty line fell by only 4.2 percent to 34.4 percent between 1991-92 and 2007 indicating the small response of poverty to growth in Tanzania. Of late, growth seems to be more poverty-reducing as another 4.2 percent of the population was lifted above the basic needs poverty line in rather a short period of time between 2007 and 2012. The percentage of the population below the food poverty line, an indicator of extreme poverty, has also declined significantly. Inequalities,

however, exist between the rural and urban populations. Poverty is more prevalent in rural areas than in urban areas.

Figure 3.1: GDP and per capita income growth rates at constant prices.



Source: Based on data from UNSD (2018)

While positive improvements are seen in the national poverty indicators the absolute number of poor has remained very high due to the rapid growth in population (World Bank, 2019). When considering the international poverty rate measure ($1.9/day PPP terms), the share of Tanzanian population living under poverty was estimated to be 48.0 percent, 47.8 percent and 47.9 percent in 2013, 2014 and 2015, respectively (World Bank, 2016).

Table 3.1: Poverty indicators in Tanzania Mainland

Poverty indicator (Headcount ratio)	**1991-92**	**2001-02**	**2007**	**2011-12**
Population below the basic needs poverty line (%)	38.6	35.7	34.4	28.2
Population below the food poverty line (%)	21.6	18.7	11.8	9.7
Urban	*15*	*13.2*	*8.9*	*8.7*
Rural	*23.1*	*20.4*	*13.5*	*11.3*

Source: TSED (2018)

Tanzania also faces employment challenges though unemployment is low compared to other developing economies (Page and Shimeles, 2014). The number of quality jobs – those that offer higher wages and opportunity for acquiring skills, as well as security of employment – is lower than what would be expected at such a high level of growth (Page, 2016; URT, 2016a). Such social developments are not in

line with the Tanzanian Development Vision 2025 which aims for a productive semi-industrialised economy by 2025.

3.3. Fundamentals as drivers of the recent growth

3.3.1. Economic and political reforms

Over the past decades, Tanzania transformed from being a centrally planned economy into a market-based economy. Following its independence, Tanzania implemented Ujamaa socialism policies between 1967 and 1985. This ideology did not create a conducive environment for stable growth leading to poor economic performance in the 1970s and 1980s. The adoption of structural adjustment programs (SAPs) between 1986 and 1995 brought positive changes to the country. The reforms ushered the beginning of a market-oriented economy which is credited for the take-off in the mid-1990s. Tanzania has improved its policies thereafter to sustain this growth rate (Robinson et al., 2011).

Tanzania has also been stable both socially and politically since independence (World Bank, 2017). The government moved from being a one-party state into a multiparty state in the 1990s, a decision that saw improvements in political competitiveness (AfDB, 2016). As highlighted by Harisson et al. (2014) political competition in SSA is associated with improvements in productivity. The political space has allowed maintenance of peace, stability and social inclusion of the various ethnic groups in the country (AfDB, 2016). This stability has created a conducive environment for private sector investments.

3.3.2. Fiscal policy

Since the implementation of reforms, the most outstanding feature of fiscal policy has been the expansion of public spending (Robinson et al., 2011). This increased public spending has had a positive effect on consumption and investment (Robinson et al., 2011). Though recurrent expenditures are the largest portion of public spending, development expenditures are also increasing, albeit from a lower base. This high spending has been devoted to the development initiatives such as MUKUKUTA, FYDP and the National Development Vision 2025 (BOT, 2017, 2018; Robinson et al., 2011). Since 2012, the greater part of the development expenditures is locally financed. Tanzania finances its expenditures through increasing revenues, borrowing locally and through foreign loans and grants. Revenue collection has exhibited excellent performance since the beginning of the previous decade reflecting good tax policy (Robinson et al., 2011) as well as improvement in tax administration (BOT, 2017, 2018). Fiscal policy improvements have allowed for the expansion of government expenditures while macroeconomic stability is maintained (Robinson et al., 2011).

3.3.3. Inflation

Tanzania managed to keep the consumer inflation rate at relatively low levels which have been instrumental to the high growth. In the past twenty years, the country only recorded a two-digit inflation rate in four years (2008, 2009, 2011 and 2012). The 2008 and 2009 surge reflect the impact of the global

financial crisis while the 2011 and 2012 hikes were due to rise in global food and fuel prices. However, inflation was maintained at a steady rate around 5 percent, thereafter, reflecting prudent monetary policies and reduction in fuel imports (World Bank, 2017).

3.3.4. The demand-side

3.3.4.1. Consumption

Since 2000, domestic demand has significantly increased and contributed immensely to GDP growth. Both government and household consumption increased rapidly. Private consumption is the major contributor to growth accounting for more than 70 percent of the growth. The contribution of government consumption to GDP growth is also increasing (World Bank, 2017).

3.3.4.2. Trade

Growth in Tanzania coincided with a period of global commodity hikes (Robinson et al., 2011). Trade has contributed little to the growth of the economy. The value of trade has remarkably increased since the year 2000. Export growth has slowed down since the last decade. Between 1990 and 2000, the average annual growth in exports was 11.7 percent and 9.2 percent between 2000 and 2017. On the other hand, import growth increased from an annual average growth of 4.7 percent between 1990 and 2000 to 10.7 percent between 2000 and 2017 (WDI, 2018). The balance of trade has been negative and thus trade has contributed less to growth.

3.3.4.3. Investment

Investment in the economy has also grown significantly over the past years, largely reflecting the effects of the reforms and stabilisation policies thereafter. Investments are a major source of productivity increases. The increase in investments is reflected in the growing gross capital formation (GCF) and gross fixed capital formation (GCFC). In the 1990s, gross capital formation grew at an average of -1.1 percent. From 2000 to 2017, GCF growth has been recorded at an average annual rate of 9.4 percent (WDI, 2018). Measured at constant 2010 prices, GCF was US$ 2,026.14 million in 1995 and increased to US$ 11,091.59 million by 2016 while GCFC was recorded at US$ 2,315.16 million and US$ 16,072.08 million in the same periods. It is, however, the private sector that is leading in the investments, unlike in the past (NBS and MOF, 2016; 2017). The GCF to GDP at market prices ratio, however, shows a declining share of investments in recent years. The World Bank (2017) highlights that the contribution of investments to growth was higher at the beginning of the new millennium and reached a peak in 2005.

Foreign direct investment (FDI) have also increased dramatically since the beginning of the last decade. The Tanzanian government has exhibited a positive attitude in attracting FDIs over the past years (International Trade Commission, 2016). In the 1980s up to the late 1990s, FDI was constrained in Tanzania due to the prevailing policies at that time. The liberalization that was completed in the mid-90s brought a turnaround in the Tanzanian economy in terms of foreign investments. The data from

UNCTADSTAT (2018) show that from as low as US$ 4.58 million in 1980, inflows of FDI dramatically increased since the beginning of the new millennium and had reached US$ 2087.3 million by 2013. The inflows, however, declined to US$ 1365.40 million in 2016. Some policy changes in tax administration and mining royalty led foreign investors to hold back their investments (UNCTAD, 2018). FDI stocks, on the other hand, have continued to increase in the same period. In 1980, FDI stocks were only US$ 342.3 million but had reached a value of US$ 14871.76 million in 2013 and went up to US$ 19817.96 million in 2016.

3.3.5. The supply-side

The service sector has immensely contributed to the accelerated growth in Tanzania, particularly trade and transport, information and communication as well as financial services. In the industrial sectors, construction and mining have been the main drivers of growth with limited contribution from manufacturing. Robinson et al. (2011) point out that the service and industrial sectors that have been the main drivers of growth are subsectors that have been liberalized. Agriculture's contribution has been limited over the past years (Robinson et al., 2011; World Bank, 2017). It is, however, a concern when considering that agriculture and manufacturing which are labour-intensive have contributed less to growth (World Bank, 2017).

3.4. Structural transformation in Tanzania

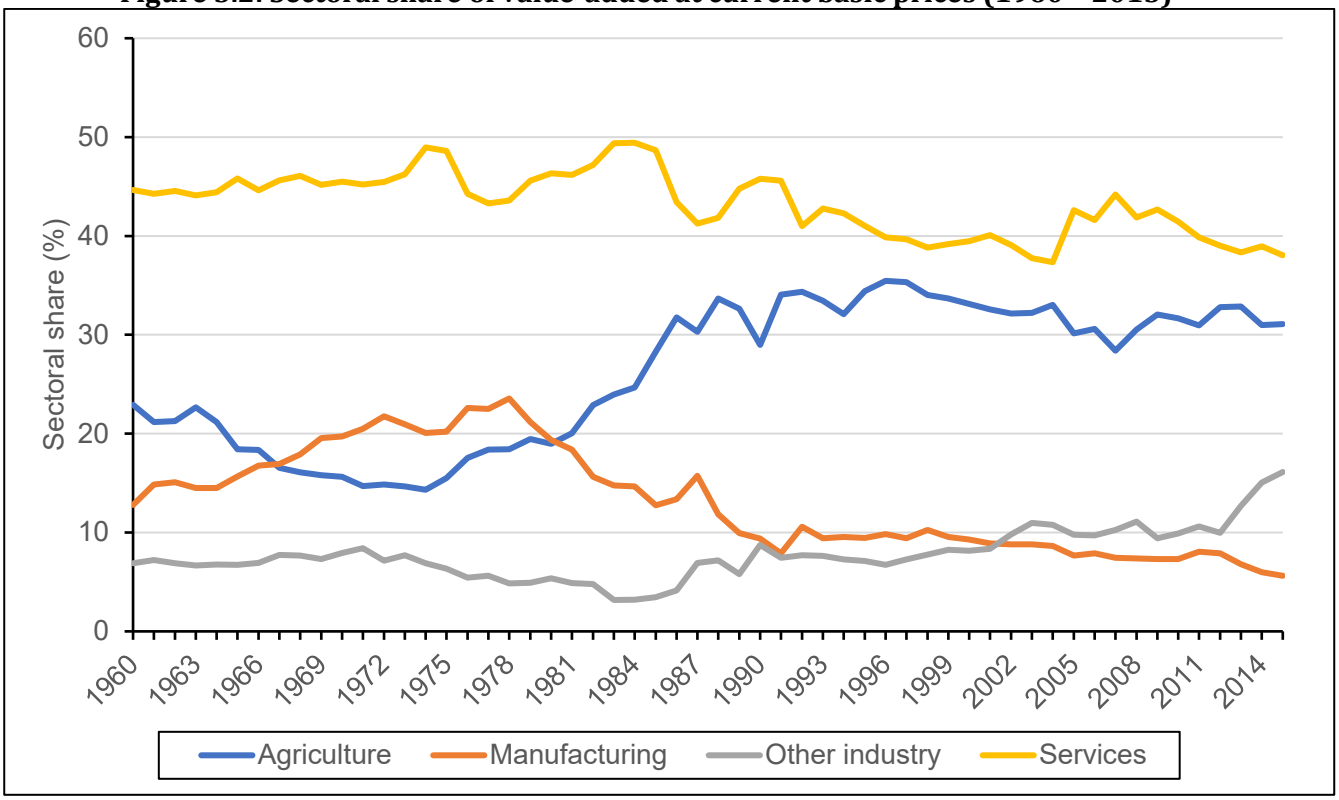
In light of the fact that successful countries have not only been able to ensure growth fundamentals but also planned for structural transformation, it is imperative to consider how the Tanzanian economy has fared in terms of economic transformation. This section highlights how Tanzania has fared in terms of structural transformation.

3.4.1. Evolution of economic structure

Unlike most former colonies that had agriculture as the highest contributor to GDP at their independence (Kolavalli et al., 2011), in Tanzania at independence in 1961 the service sector was the dominant sector. Figure 3.2 below presents the trends in the sectoral contribution to gross value-added at current basic prices between1960 and 2015. The service sector has remained the largest sector in the economy's output since independence (Figure 3.2). However, the sector's value-added share has declined since the mid-1980s. The sector now accounts for only 37.5 percent (in 2017) of total output (NBS and MOF, 2018). Agriculture, on the other hand, has followed an opposite trend to that of services. In the early 1970s, agriculture's contribution declined but since increased starting from the mid-1970s reaching a peak in the mid-1990s. Since then, the sector's contribution has remained almost unchanged and accounted for 30.1 percent of the total GDP in 2017 (NBS and MOF, 2018). When services are disaggregated, however, agriculture has the largest contribution to the economy's output.

Manufacturing's value-added share in total output increased in the 1970s reaching a peak in in the late 1970s. This was a period of state-led industrialisation. However, the contribution of other industries declined during that period. The total industry's contribution to output saw a decline in the late 1970s to the early 1980s. This decline was due to the economic crisis that prevailed in the country during the period. Following the reforms in the mid-1980s, the other industries' contribution to output has been increasing. Manufacturing's value-added share has, however, continued to lose its share in the total output. The sector's value-added now accounts for about 5.62 percent in total GDP (Figure 3.2).

Figure 3.2: Sectoral share of value-added at current basic prices (1960 – 2015)



Source: Based on Expanded Africa Sector Database[2] (Mensah and Szirmai, 2018)

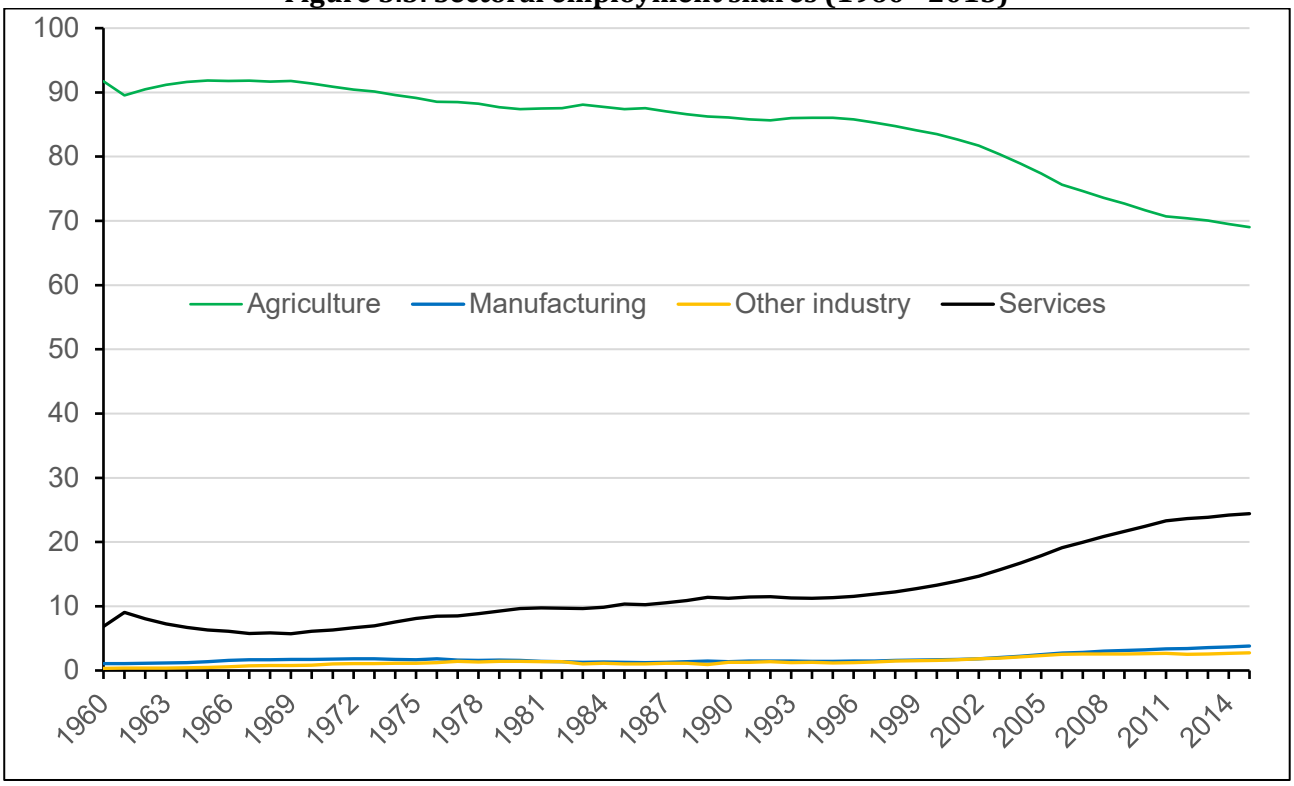
3.4.2. Employment and labour productivity

As mentioned earlier, structural transformation is a defining feature of economic development. However, not much shift of employment from the less productive subsistence-oriented agricultural sector to more dynamic sectors took place in the first four decades in post-independent Tanzania. From claiming about 90 percent of the total employment at independence, agriculture's share in employment increased to about 92 percent in the 1970s and gradually declined to 83 percent by the beginning of this century. Manufacturing and other industries did not gain much in employment shares during that period. These industrial sector's share in employment slightly increased in the 1960s but de-

[2] The database consists of 10 sectors. Mining, construction and utilities are aggregated as other industries. Services value-added consists of value-added trade services, business services (excluding dwellings), government services and personal services sectors.

industrialisation took place from the 1970s to the late 1990s when these sectors' share in employment started to increase again. The service sector's contribution to employment, on the other hand, increased as de-industrialisation took place (Figure 3.3).

Figure 3.3: Sectoral employment shares (1960 - 2015)



Source: Based on data from Africa Sector Database ((Mensah and Szirmai, 2018)

The accelerated growth at the beginning of the new millennium has however been accompanied by some significant structural transformation as depicted by the accelerated decline in agricultural share in employment (Figure 3.3). With the growing population, Tanzania was able to create new jobs which were a major part of the structural change as non-agricultural sectors accounted for most of the new employment (Table 3.2). As shown in Table 3.2, the agricultural sector has the least productivity (value-added per worker) and by shifting employment to more productive sectors, economy-wide productivity, growth, and incomes will increase.

The decline in agriculture's share in employment was more rapid between 2000 and 2014 than in the previous four decades which has resulted in increases in labour productivity. Diao et al. (2017) highlighted that labour productivity increased at a rate of 4.1percent per annum between 2002 and 2012 with 80 percent of this increase accounted for by structural transformation. About three-quarters of the created jobs outside agriculture were in the private sector (Diao et al., 2017).

Table 3.2: Employment and value-added by sector (2001 – 2014)

	Employment by Sector, Percent of Total			Employment by Sector. Percent of Annual Growth			Value-Added per Worker, Constant TZS[3] Millions		
	2001	2006	2014	2000-2006	2006-2014	2001-2014	2001	2006	2014
Agriculture	82.4	76.5	66.9	1.0	0.7	0.8	0.48	0.55	0.71
Mining	0.2	0.5	1.1	44.7	19.8	56.7	20.64	10.15	6.15
Manufacturing	1.6	2.6	3.1	17.1	5.3	12.6	5.03	3.88	4.99
Utilities	0.1	0.1	0.2	3.9	11.7	10.1	26.38	26.80	19.62
Construction	1.0	1.1	2.1	4.5	17.0	14.6	6.81	10.47	10.13
Commerce	9.7	9.6	16.6	2.5	13.5	10.3	1.39	1.73	1.42
Transport	0.7	0.5	2.8	25.0	15.8	31.5	12.69	8.45	7.58
Finance	0.2	0.1	0.3	-6.1	30.8	10.8	14.08	35.29	27.78
Other services	0.4	8.1	7.0	23.6	0.6	9.9	7.77	4.63	6.47
Total	100	100	100	6.13	6.29	6.23	1.18	1.42	1.94

Source: World Bank (2017)

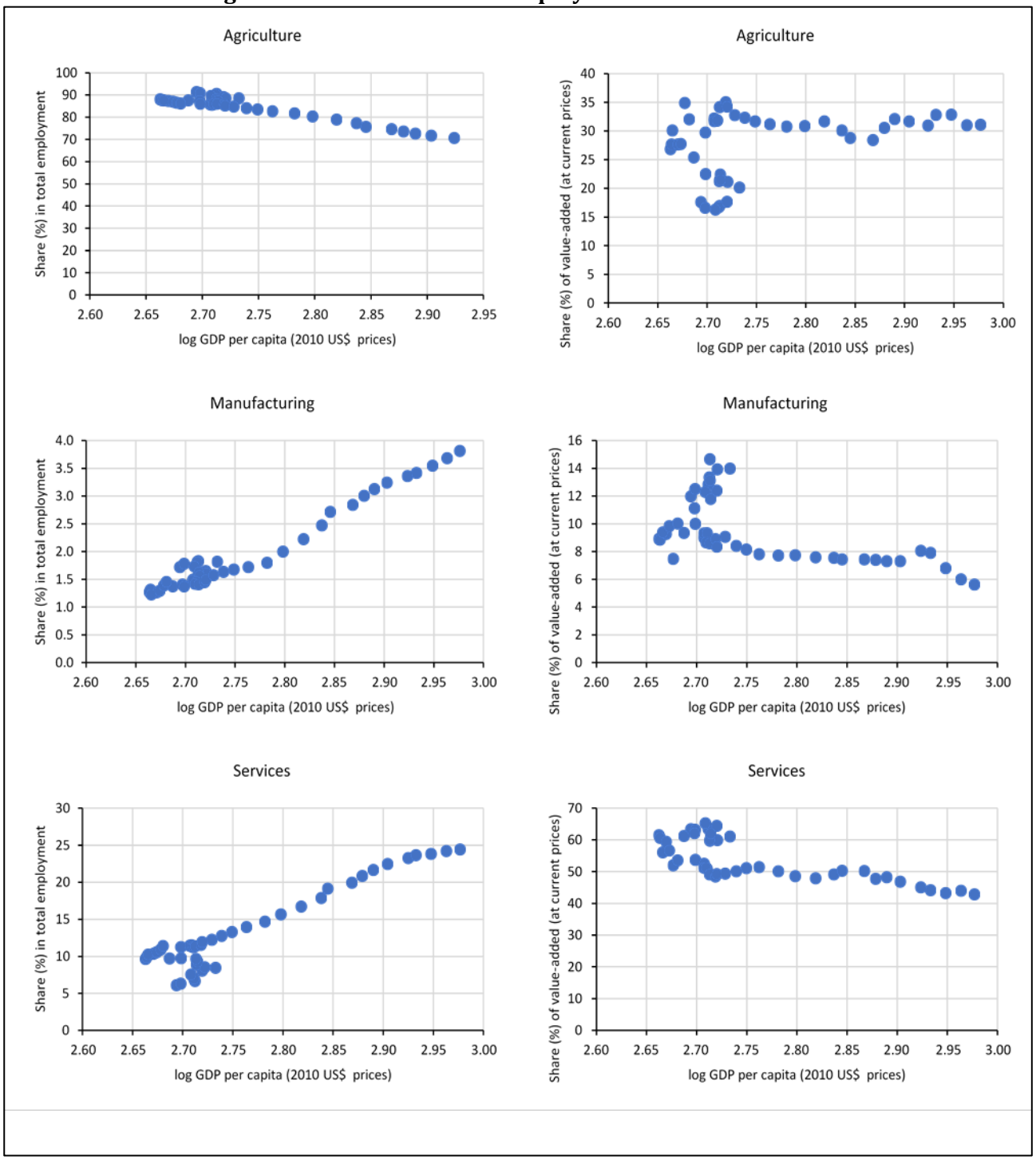
Manufacturing's contribution to employment almost doubled between 2001 and 2014. However, the sector's employment share is still very low at 3.1 percent. The sector's annual employment growth was very high at the beginning of the new century but has, however, slowed down which is even worrying. The majority of labour that has moved out of agriculture has been absorbed mainly in services, particularly tradable services (commerce). Productivity in these services is, however, lower than in manufacturing and not much higher than in agriculture. In addition, the creation of the new jobs was mainly driven by small and micro enterprises in the informal rather than the formal sector (Diao et al., 2017; Ellis et al., 2017). The informal sector is less productive and an employer of last resort. Even if some of these firms are highly productive, growth in these firms is limited (Diao et al., 2017).

3.4.3. Pattern of structural transformation

This section follows the discipline of plotting shares of employment and value-added at current prices against the log of GDP per capita to depict the pattern of structural transformation (Herrendorf et al., 2013) among the three broad sectors. As depicted in Figure 3.4, with increase in per capita GDP over the past decades, employment is shifting from agriculture towards manufacturing and services which is in line with the stylised facts of structural transformation. However, the reallocation of output with the increase in income among the broad sectors are not in line with literature. Contrary to the stylised facts (Herrendorf et al., 2013) the value-added shares of both the manufacturing and service sectors are decreasing while agriculture's share has remained high.

[3] TZS is the local currency, the Tanzanian shilling. As at 30 June 2017, US$ 1 was equivalent to TZS 2,230.1 (BOT, 2017)

Figure 3.4: Sector's share of employment and value-added



Source[4]**:** Based on data from UNSD (2018) and Expanded Africa Sector Database (Mensah et al., 2018)

3.4.4. Structure of trade

Page (2012) highlights that developing countries that are able to diversify production and at the same time replicate the sophisticated production and exports of high-income countries, will grow faster. Since the turn of the century, Tanzania has made some progress in diversifying its export basket in

[4] The value-added share and GDP per capita are from the UNSD database while the employment shares are from the Expanded Africa Sector Database

which raw materials accounted for more than half of the exports (Table 3.3). This has increased the resilience of the economy (World Bank, 2017). However, the share of raw materials is still very high. Dependence on raw material exports thus makes the country more vulnerable to volatilities in prices.

The country has mainly shifted towards exports of intermediates whose share has increased by more than 15 percent. Intermediate imports have also increased. Unfortunately, the share of consumer goods exports has decreased, and Tanzania is relying more on imports of consumer goods. This reflects the limited value addition in the country. The country has the potential for import substitution of consumer goods which can further propel the growth of the economy.

Table 3.3: Structure of Tanzanian trade

	EXPORT SHARE (%)		IMPORT SHARE (%)	
	2000	2016	2000	2016
Raw materials	55.31	40.26	3.81	4.02
Intermediates	32.64	48.48	19.00	24.63
Consumer goods	11.36	9.62	32.09	43.61
Capital goods	0.61	1.58	26.98	27.74

Source: WITS trade (2018)

Capital goods exports have a small share although this share has increased slightly. At the current stage of development, Tanzania will rather need more capital goods imports as these are sources of productivity. However, the share of capital goods imports is lower than expected.

3.4.5. Benchmarking Tanzania's progress

It is important to benchmark the country's performance against other countries. In 2014, Tanzania's GDP per capita was recorded at US$ 1043 which placed it in low-income countries group. The average share of agriculture in total employment for the low-income group was around 63 percent while this was even lower for the SSA region, at 55.76 percent. In terms of output, on average, the sector only accounts for 10 percent of the total output in low-income countries. Tanzania's agricultural sector however still boasts two-thirds of the total employment and contributes around a third of the total output. Thus, the contribution of agriculture is too high at the current level of income. On the other hand, the contribution of the industry, particularly manufacturing is below what it should be based on the country's per capita income (Dinh and Monga, 2013; Page, 2016). Tanzania's structural transformation does not compare well with benchmarks with the same level of income. The gap is even larger when considering the structural characteristics of successful East Asian countries (when they had the same income levels as Tanzania today) or the lower-middle-income countries where Tanzania is striving to be in less than a decade (Page, 2016; World Bank, 2017). Tanzania will need rapid structural change to catch up with other countries.

3.5. Remarks on the recent developments

The above sections highlighted the current growth path of Tanzania. The economy has grown rapidly in recent years, but challenges of poverty and lack of productive jobs persist. A look in the drivers of growth shows that fundamentals of growth, particularly good governance and macroeconomic stability have played a major role in the recent growth. Structural transformation, on the other hand, has not fared well. Agriculture has remained the biggest contributor to employment and still has a high share in output while manufacturing's contribution to both output and employment remains very low. While labour is moving out of agriculture, it has been mainly absorbed in the services and informal sectors whose productivity is not much different from that of agriculture. As measured by the value-added per worker in 2014 (Table 3.2), productivity in tradable services was only twice that of agriculture while productivity in manufacturing was seven times higher than that of agriculture. Structural change towards services thus results in a limited increase in productivity and consequently low economic growth. The large differences between sectors mean that Tanzania has a better opportunity to accelerate growth through structural change. As highlighted earlier, without significant structural change, efforts for poverty reduction will be fruitless. The growth fundamentals alone cannot ensure the much-needed job creation and thus there is a need to plan for economic transformation.

With the aim of reaching middle-income status by 2025, the country will have to ensure rapid growth incomes against the growing population. While population growth is a challenge, the country stands to benefit from it if the right actions are implemented. The country is in the early stages of a demographic transition (World Bank, 2015) and hence a large youthful population. In 2016, 43.74 percent of the population was under the age of fifteen, the 15-24-year age group made up 19.86 percent and 29.88 percent of the population was between 25 and 54 years (CIA, 2018). Each year thousands of youths are added to the country's labour force. By creating new productive jobs and educating the youths so that they can be gainfully employed, the country can benefit from the demographic dividend (AFIDEP, 2014; World Bank, 2015). The World Bank (2015) and AFIDEP (2014) note that the East Asian countries had the same population structure as Tanzania's decades ago. They benefited much from the population through export and labour-intensive growth models (World Bank, 2015). However, Tanzania has not capitalized on this advantage. A significant number of these youths are either unemployed or underemployed. Youth unemployment was 14.9 percent in 2006 and 13.7 percent in 2014. Total underemployment was 6.9 and 10.8 percent in the same years respectively (ECA, 2015).

Going forward, Tanzania needs to accelerate growth through labour-intensive productive sectors that will attract labour away from the low productivity sectors and boost economy-wide productivity. It is important to ask which sectors will drive this transformation. Due to the abundance of agricultural resources, the country has an opportunity for an agricultural-led transformation (World Bank, 2017). On the other hand, Tanzania is currently experiencing rapid urbanization and if proper policies are implemented, this offers an opportunity for the country to diversify by creating new jobs in formal

manufacturing and services (World Bank, 2014; 2017). As highlighted by Diao et al. (2019), service-based transformation is questionable. The service sector which has the capacity to absorb large numbers of workers is characterized by a high degree of informality and productivity in the sector is not much different from that of agriculture. The type of employment offered by the sector is not the kind of productive employment that can result in a rise in living standards needed among the Africans (McMillan et al., 2017). The two pathways to ensuring transformation will thus be ensuring productivity in agriculture and expanding the industry. The following section discusses the possibilities of these pathways.

3.6. Tanzania pathways to structural transformation

3.6.1. Agriculture

Primary agriculture is a vital economic activity in Tanzania as it sustains the lives of more than two-thirds of the population. As a result, the development plans in Tanzania priority on the sector. The sector has the potential to lead the broad economic transformation process (World Bank, 2017) but has not fully realised its potential despite being favoured by the abundance of natural resources. Cultivated land area is about a third of the total arable land (World Bank, 2014). In addition, Tanzania has vast inland water bodies but only a small portion of the agricultural land is irrigated (World Bank, 2017). Transformation is still to take place within agriculture (ACET, 2015). Production is mainly subsistence-oriented under rain-fed conditions, carried out by multiple small-scale farmers with farms with an average size of 0.9-3.0ha (GAFSP, 2016). Small-scale farmers accounted for 91 percent of the total farmers in the 2007/2008 census. These farmers mainly produce staple crops. In the 2016/17 season, 55.8 percent of the farms produced crops only, 41.8 percent produced both crops and livestock while 2.4 percent of the farms only produced livestock (URT, 2018a).

Experiences in successfully transformed countries show changes in the composition of agricultural output over time, with the share of crops and forestry decreasing while the importance of livestock and fishing increases. However, this has not been the case in Tanzania as crops' share has remained dominant, over 70 percent, and has gradually increased while livestock's is gradually declining. The rebasing of national accounts decreased the shares of crops and increased that of livestock but the trend in output has not changed (Table 3.4).

Within the crop sub-sector not many changes have taken place between food and cash crops since 1980 as maize, banana, paddy and cassava have remained the major crops produced. However, some diversification is being observed as the production, value, and area under cultivation of fruits and vegetables is gaining share (World Bank, 2014). Agricultural exports are however still dominated by the traditional export crops. Unprocessed tobacco, coffee and cashew nuts remained the top exports between 2000 and 2011 by value (ACET, 2015). In 2016, these crops accounted for 27 percent of total agricultural (including processed products) exports (ITC Trademap, 2018). The country has not taken

advantage of the growing crops it produces due to lack of competitiveness (ACET, 2015; World Bank, 2014). This lack of competitiveness might explain why demand for maize, wheat and other products is being met through imports.

Table 3.4: Structure of agricultural GDP in Tanzania

	Share in AgGDP at 2001 Prices (%)					Share in AgGDP at 2007 Prices (%)			
	2001	2004	2007	2010	2013	2007	2010	2013	2016
Crops	69.75	70.63	71.03	71.75	72.38	50.18	50.99	52.27	52.15
Livestock	16.47	15.70	15.22	14.72	14.58	35.00	34.81	33.34	33.13
Forestry & hunting	8.27	7.87	7.78	7.72	7.53	8.91	8.66	8.80	9.08
Fishing	5.51	5.79	5.97	5.82	5.51	5.91	5.54	5.60	5.64
Total	100	100	100	100	100	100	100	100	100

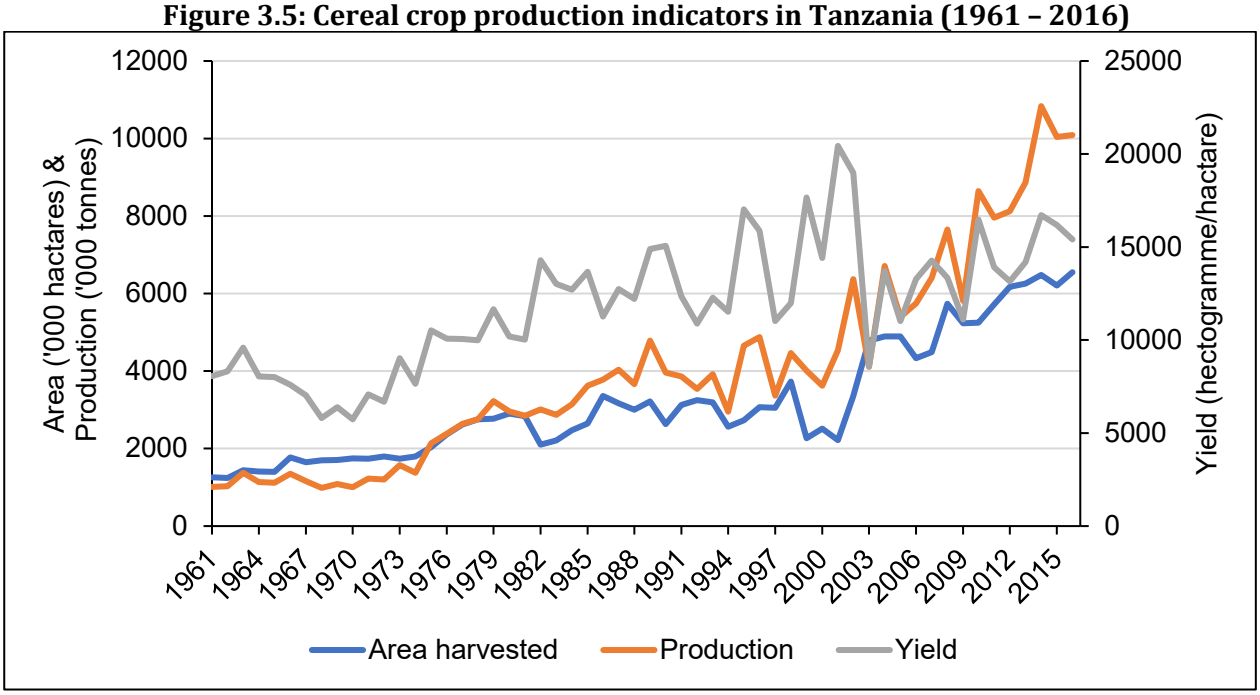
Source: Based on calculations from Tanzania National Accounts (NBS and MOF, 2014; 2018)

The value-added of the sector has been increasing since the beginning of the past decade. In the previous decade, agriculture growth was high, averaging 4 percent. This was however lower than the rest of the economy's growth and falls short of the 6 percent target under the CAADP program. Cereal production increased more dramatically between 2000 and 2016 than in any other period since the country's independence (Figure 3.5). Figure 3.5 also shows that the harvested area also expanded rapidly during the same time and yields decreased though they have been rising recently. Thus, much of the increases have rather been on area expansion than on the productivity of the land. As in the Thailand case (Breisinger and Diao, 2008), considering that the population is increasing and there is still vast of unused arable land in the country, production increases might continue to be accounted for mainly by area expansion in the short-term. Tenure rights might, however, prohibit the expansion of agricultural land (Sulle, 2017).

Despite their recent observed increases, the World Bank (2017) highlights that both productivities of land and labour are still below international standards. The SSA region's labour productivity average is currently twice as much as Tanzania's. Productivities in Ghana, which recently attained the middle-income status, and Kenya are four times higher (WDI, 2018). This is rather disappointing considering that the comparators also fall below the international standards.

The use of modern inputs and technologies are important sources of productivity increases and transformation of agriculture (Kovalli et al., 2011). However, this has been limited in Tanzania (ACET, 2015; URT, 2011; World Bank, 2017). Tanzania needs to increase its use of modern inputs. ACET (2015) highlights that recent increases in productivity have been due to government fertilizer subsidies. Nevertheless, the World Bank indicators show that fertilizer application is still very low in Tanzania. In 2015, Tanzania's fertilizer consumption was about 8.85 kg/ha which was 1.7 times lower than the regional average and 3.22 times lower than its East African Community (EAC) counterpart, Kenya.

Figure 3.5: Cereal crop production indicators in Tanzania (1961 – 2016)



Source: FAOSTAT (2018)

The URT (2011) also highlight that agricultural development is delayed due to weak market linkages which disincentivizes commercialization, inadequate agro-processing and value addition facilities which culminate in postharvest losses, little knowledge about new technologies and lack of access to finances. To unlock its potential for driving the transformation process, there is a need to increase productivity through the adoption of modern inputs and technologies. There is a need also for diversification into non-traditional agricultural sectors and higher value agricultural crops. This can result in productivity gains and lead the transformation of the sector and the broader economy (Barret et al., 2017; Kovalli et al., 2011).

While increasing productivity in agriculture is crucial, Barret et al. (2017) highlight that agricultural transformation requires accelerated growth of downstream agricultural value chains. The Thailand case discussed in the previous chapter also shows that major transformation in the agricultural sector was achieved when the labour-intensive agro-processing sectors started expanding. Tanzania will not be an exception. According to the World Bank (2017), a study by Mashinda et al. (2011) found that locating processing plants to the proximity of vegetable producers in the Arusha region in Tanzania resulted in 71-100 percent increases in crop production. Adam et al. (2016) highlight that, due to growing urban demand for food in Tanzania, the potential of agriculture will be realised by connecting the supply to the markets. Thus, agricultural transformation will be mainly driven by expansion of agro-processing industries and integrating the value chain than through productivity increases. This signifies the need for increasing agro-processing activities.

3.6.2. The Industry

3.6.2.1. History of Industrialisation in Tanzania

From independence, industrial development was considered as a means of fostering economic transformation in Tanzania (Wangwe et al., 2014). Various industrial development plans have since been adopted to ensure industrial development. The set of economic policies can be divided into four phases namely:

i. The early post-independence industrialisation (1961 – 1967)

Following independence, the government of Tanzania adopted similar economic policies to that of the colonial regime (Bigsten and Danielsson, 1999). The government launched a three-year plan (1961-64) which emphasized growth and targeted investments that would bring quick and higher returns (Msami and Wangwe, 2016; Skarstein and Wangwe, 1986; Wangwe et al., 2014). An import substitution policy was pursued, and investments were mainly driven by the private sector dominated by foreign investors. An open economy was maintained. The plans attracted investments in basic consumer goods.

The number of industries, as well as manufacturing output, increased during this period. However, the country's imports from the East African Commission region outweighed its exports (Msami and Wangwe, 2016; Skarstein and Wangwe, 1986). The country then negotiated to set independent policies from the regional board in a quest to attract investments as they were mainly concentrated in Kenya (Skarstein and Wangwe, 1986). This resulted in tax incentives that protected weaker industries. A five-year plan (1964-1969) followed at the end of the three-year plan. The plan shared common objectives with its predecessor; to raise incomes, increase employment and to raise life expectancy (Msami and Wangwe, 2016). The results of the plans were an increased share of manufacturing in GDP and increased labour productivity. Share of manufacturing in GDP was 10.2 percent in 1967 (Msami and Wangwe, 2016).

During the period, production was mainly in the hands of foreign investors and that led to challenges among the politicians. The two plans failed to promote local ownership and thus the government felt the need to revise its policies.

ii. The Socialist era industrialisation (1967-1985)

The concerns of too much foreign dependence led to the signing of the Arusha Declaration of 1967 which promoted socialism and reduced ownership of foreign investors over the major means of production such as land, oil, and major industries (Skarstein and Wangwe, 1986). Between 1967 and 1968, nationalisation of private-owned firms took place and foreign ownership was reduced. The state-controlled most of production in the economy and pursued an import substitution policy. The population was also forced into Ujamma villages to promote co-operative agriculture. The government established its monopoly marketing boards (Bigsten and Danielsson, 1999). The public sector expanded and so did manufacturing activities and productivity (Msami and Wangwe, 2016).

In the early 1970s, the government heightened its influence in monetary and exchange rate policies. By 1973, the state exercised full control on prices and regulated capital flowing in and out of the country. The exchange rate became overvalued and the country experienced major foreign exchange shortages as the revenue earned from exports declined (Wangwe et al., 2014). This caused the balance of payments to deteriorate and the oil crisis in 1973 worsened the situation. At the same time, the country experienced rising inflation (Bigsten and Danielsson, 1999; Msami and Wangwe, 2016). Bigsten and Danielsson (1999) pointed out that a major coffee boom between 1975 and 1978 helped to ease the strain on the balance of payments.

Industrial performance was negatively affected between 1973 and 1974 (Skarstein and Wangwe, 1986). Nevertheless, the manufacturing sector was successful in meeting a greater percentage of the country's demand for consumer goods. There was however a challenge in improving the absorption capacity of technology transfers (Msami and Wangwe, 2016). To address the shortcomings of the policies, a 20-year (1975-95) basic industrial strategy (BIS) was adopted. In the plan were national goals to be met through industrial development, an outline of resource allocation and the selection of priority industrial sectors. Seven national goals (including growth and employment), were outlined but the perceived impact of the strategy on the two goals, structural change and self-reliance, was the major reason for adopting the BIS (Msami and Wangwe, 2016; Wangwe et al., 2014). The plan aimed at expanding the manufacturing sector. Import substitution industrialisation was emphasised as well as the use of local resources in manufacturing.

The country's overvalued currency and foreign exchange shortage problems were still unresolved by the early 1980s and the crisis prevailed. The Ugandan war (1978-79) and the second oil crisis of 1979 worsened the economic situation. Fiscal deficit increased, export earnings declined, inflation increased and economic and industrial growth stagnated (Bigsten and Danielsson, 1999). Donor funding declined as the donors became sceptical about Tanzania's development policies (Bigsten et al., 1999). The International Monetary Fund (IMF) attempted to negotiate with the government to reform its policies, but the negotiations were unfruitful as Tanzania ruled out the financial institution's policies such as devaluation (Bigsten and Danielsson, 1999). The Tanzanian government was devoted to rather addressing the challenges on its own. This is reflected in the introduction of strategies such as an export rebate system (ERS) together with the general retention scheme (GRS) in 1981 and the 1981-82 national economic survival programme (NESP). The results of the policies were unsatisfactory as the economic turmoil persisted (Bigsten and Danielsson, 1999; Msami and Wangwe, 2016; Wangwe et al., 2014).

iii. The Structural adjustment period industrialisation (1986-95)

Having failed to resolve the economic crisis with home-grown policies, the Tanzanian government finally considered the IMF's policy packages and specifically adopted the Economic Recovery Programme (ERP) in 1986. The programme's major objectives were to speed up structural reforms and

restore economic stability (Msami and Wangwe, 2016; Wangwe et al., 2014). The policies addressed the liberalisation of trade, adjustment of the exchange rate regime, boosting of domestic savings and fiscal stability (Bigsten and Danielsson, 1999). The ERP also included agricultural, social services, credit and financial policy reforms as well as the restructuring of parastatals and privatisation (Wangwe et al., 2014). The government encouraged private sector participation in agricultural marketing to boost investments (Msami and Wangwe, 2016). In the period 1986 – 92, the government discretionarily adjusted its exchange rate causing the depreciation of its currency that was by then overvalued (Bigsten and Danielsson, 1999).

The reforms resulted in de-industrialisation. Industrial output declined and the share of manufacturing in total output and employment declined during the reform period. The policies also led to technological downgrading. An example of this downgrade is the textile sector where there was a shift from the production of colour printed products to gray products (Wangwe et al., 2014).

iv. The return to industrialisation (1996 – present)

It became apparent that there was a need to revert back to industrial development and long-term planning, and the Sustainable Industrial Development Policy (SIDP2020) was adopted in 1996 to foster the sustainable development of the Tanzanian industrial sector. The SIDP reinforced government decision to reduce public sector investments in productive activities and encourages private sector-led development (URT, 1996). The government has a major role in creating an enabling environment in which the private sector investments can thrive. Export Processing Zones (EPZ) and infrastructure development is part of the actions of the government to support private sector investments. Under the strategy, industrial development must foster human development, employment creation, economic transformation, equitable development and contribute to external balance. The SIDP recognises the importance of both domestic and export markets (URT, 1996) and thus industrial production must balance production to substitute imports and producing for export markets (Wangwe et al., 2014). Special Economic Zones (SEZ) were established in 2006 to meet the Tanzania Mini Tiger Plan 2020 which aims to promote rapid growth, increase export earnings, create employment and attract both FDIs and domestic investments.

The need to strengthen the small and medium industries as well as to transform the informal sector into a formal industrial sector is recognised as crucial in the SIDP. The government implemented the Small and Medium Enterprise Development Policy (SMEDP) in 2003 with the aim to support small and micro firms to unleash their potential in employment creation, to generate income and to reduce poverty in the industrialisation process. The policy aims to reduce the impediments to the expansion of these firms. Agro-processing activities are recognised as important in adding value to agricultural products and dispersion of industries to the rural areas under this policy (MITI, 2003). Through the Tanzania

Investment Centre, the government has been training these entrepreneurs and facilitating linkages between small and medium enterprises and transnational corporations or large local firms (TIC, 2018).

Three phases of implementation were highlighted in the SIDP plan. A short-term programme (1996-2000) marked Phase I aimed at revamping and strengthening existing industry capacities. Agro-industries were accorded priority in this phase. Phase II (2000-10) was a medium-term programme aimed at generating new capacities. The focus was given to activities that had the potential to develop competitive advantages through the learning process and the efficient use of technology. Machinery, intermediate and light capital goods industries were given priority. The long-term programme, Phase III (2010-20) aimed at investing the capital gathered in the first two phases into capital goods industries.

In 1999, the government also implemented the Tanzania Development Vision (TDV) 2025. This vision aims at a semi-industrialised economy by 2025, with a transformed, highly productive agricultural sector with linkages to the industry and service sectors (URT, 1999). Poverty reduction and human development are emphasized in this development vision — the plan aimed at a competitive economy with shared benefits in economic growth. Emphasis was also put on the effective utilization of local resources. The vision recognises the importance of economic transformation through industrialisation, including agro-related industries.

The continuous implementation process of TDV 2025 led to Long Term Perspective Plan (LTPP) 2011/12 – 2025/26, which sort to link the TDV 2025 with the previous plans (URT, 2012). The LTPP was divided into three five-year development plans (FYDP I, II and III).

3.6.2.2. Current Structure and Performance

Despite the long history, the industrial sector has contributed less to the Tanzanian growth story (Page, 2016). Table 3.5 shows the structure of the industrial output.

Table 3.5: Structure of Tanzanian industry (% share in industry GDP)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mining and quarrying	17	15	15	20	22	22	19	16	16	19	18
Manufacturing	35	34	37	34	33	34	28	24	21	20	21
Electricity supply	4	4	5	4	3	4	4	5	4	3	2
Water; sewerage; waste	4	4	4	3	2	2	2	2	2	2	2
Construction	39	43	39	38	39	37	48	53	56	56	57
Total share	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Own calculations based on NBS and MOF (2018)

The most dynamic sector is the construction sector which is the largest contributor to industrial output. The average growth rate of construction value added since 2000 was twice the total GDP growth (NBS

and MOF, 2018). This growth has been driven by increase in residential and non-residential buildings. The contribution of the sector to industrial output increased from 2007 by 46 percent to 57 percent in 2017. However, the construction industry has weaker linkages with the rest of the economy compared to manufacturing and is mostly untradeable (Kovalli et al., 2011). The mining and quarrying industry's contribution has remained relatively unchanged around 18 percent. Mining is relatively capital intensive but has been a major driver of growth in the economy in the last decade (AfDB, 2014; Wangwe et al., 2014) which partly explains the slow growth in productive jobs and poverty reduction (AfDB, 2014). The electricity supply industry's contribution has also been constant at 4 percent but has seen a decrease to 2 percent in recent year. This sector is considered the worst performing infrastructure sector (OECD, 2013) yet its success is crucial for other industries. Water, sewage and waste industries' share declined from 4 to 2 percent between 2007 and 2011 and has since stabilized at 2 percent (Table 3.6).

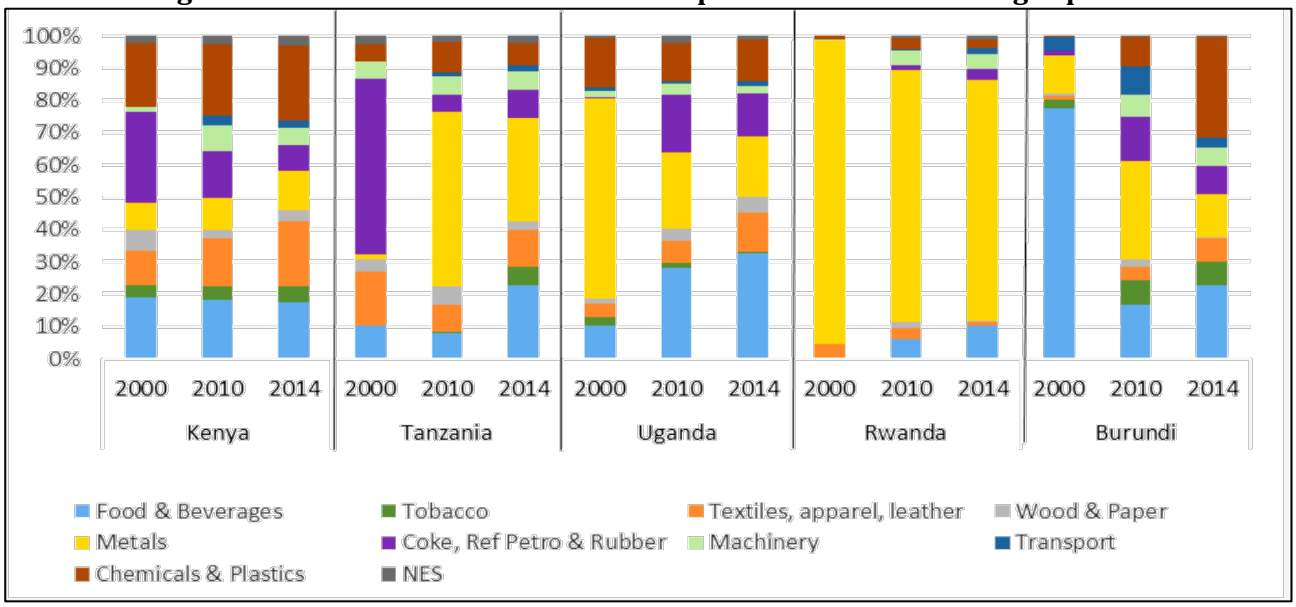
3.6.2.3. Manufacturing

In the TDV 2025 as well as the LTPP (2010/11 – 2025/26), Tanzania identifies a manufacturing-led structural transformation as inevitable to sustain growth and development, and to the shift into a more inclusive society (Andreoni, 2017). The manufacturing sector is however relatively small and has, over the long run, shown limited development (URT, 2007; AfDB, 2014). It is characterized by a three-tier structure. At the top is a small group of medium and large-scale manufacturers employing more than 50 workers. The second tier is characterized by small and micro enterprises employing less than 50 workers while at the bottom of the structure are household enterprises without paid employees (Page, 2016). Informal employment is very high in the manufacturing sector. Structural transformation is needed within the sector. The sector is less diversified and sophisticated, with food and beverages claiming about 40 percent of the sector's output (URT, 2016a). Agro-processing activities in total contribute more than half of the sector's output. Food products, beverages, tobacco and clothing has shown increased growth in recent years (BOT, 2017). The metal sub-sector also contributes a significant percentage to the total production of the sector. Thus, manufacturing is mainly resource-based in Tanzania. The MITI (2016), however, highlights that the dominant sectors are rather not the most productive.

Despite the declining contribution of the sector to the total output mentioned earlier, the sector has grown rapidly since the beginning of the last decade. Manufacturing value added (MVA) rose from US$ 978.68 million to US$ 3.37 billion (measured at 2010 constant prices) between 2000 and 2017. In the previous decade, the average annual growth rate in MVA was 9 percent which exceeded the economy's growth rate. This high growth rate together with the recent gains in employment shares suggests no signs of de-industrialisation in the recent period (Diao et al., 2017). The sector outperformed its competitors in the EAC region (UNIDO, 2012).

Manufacturing also showed some resilience in its contribution to GDP growth over the past decade (Wangwe et al., 2014). The growth rate has however slowed down in the current decade which is worrying as other countries such as Ethiopia are rising rapidly and can soon outperform Tanzania (MITI, 2016). MVA per capita also increased between 2000 and 2014 from US$ 28.53 to US$ 53.55. Compared to the other EAC countries, the country is doing well above Rwanda and Burundi but is lagging behind Uganda and the regional leader Kenya. In 2014, Kenya and Uganda's manufacturing value added per capita were US$ 115.51 and US$ 60.22 respectively (WDI, 2018). Tanzania has however been closing the gap with its comparators in East Africa (EAC, 2017; Wangwe et al., 2014). Nevertheless, when benchmarked against global comparators with similar incomes, the country shows that manufacturing performance in Tanzania is below international standards (Page, 2016; Wangwe et al., 2014).

Figure 3.6: Structure of Tanzania and its partners' manufacturing exports



Source: EAC (2017)

The sector's exports also grew significantly over the last decade at an annual average of 31 percent (AfDB, 2014; UNIDO, 2012), outperforming its EAC region counterparts (MITI, 2016). The exports have however been dominated by metals (UNIDO, 2012) but some diversification is underway with food products increasing their share in exports. The country's structure of exports compares well with that of Uganda and Burundi in the EAC region while Kenya is however more diversified (Figure 3.6). Manufactures' share in total exports is still low and so is the share of medium-tech exports among the manufactures (MITI, 2016). There is a need for diversification and sophistication as this is associated with sustainable growth (Page, 2012). Tanzania also needs to diversify its export markets (AfDB, 2014; UNIDO, 2012).

Despite the recent observed positive changes, sectoral upgrading and further value addition are much needed in the sector. Page (2012; 2016) emphasizes the need for developing firm capabilities, attracting FDIs, pursuing export push and encouraging cluster-based development for manufacturing to succeed.

While Tanzania has focused on attracting FDIs, it has lagged in skills development and investments which are a driver of capabilities. Manufacturing's share of GFCF decreased from 20 percent in 1995 to around 7 or 8 percent between 2003 and 2010. Imports of capital goods which are important especially at early stages of development are still low in Tanzania (MITI, 2016). In addition, the level of research and development is low as compared to Kenya, Mozambique and Uganda (EAC, 2017). Both the private and public sectors' efforts in developing firm capabilities are required in Tanzania (MITI, 2016). Infrastructure bottlenecks and limited access to credit also hinder the success of the sector.

Value addition is still limited in the sector (MITI, 2016; UNIDO, 2012). There are concerns whether the positive changes observed recently will be sustainable with a continued focus on resource-based, metals and extractive, industries that have limited value-added growth (UNIDO, 2012; Wangwe et al., 2014). Wangwe et al. (2014) highlight that the country must move to higher value addition and transform its economy based on comparative and competitive advantage. Tanzania has a comparative advantage in light manufacturing (Dinh and Monga, 2013; AfDB, 2014). Adding value through enhancing processing of agricultural products can be a starting point for transforming Tanzania (Wangwe et al., 2014; World Bank, 2017; Dinh and Monga, 2013). Agricultural value chains are long and if the agro-industrial sector is expanded, quite a few productive jobs can be created.

3.6.2.4. Prospects for Industrial Policy

Industrial policy in Tanzania will need to address mainly the investment climate, particularly infrastructure challenges which include transport and electricity, among others. An unreliable power supply is a major constraint to manufacturing in Tanzania. Electrification is still low especially in rural areas and supply services are poor (World Bank, 2017). Rural electrification was estimated to 7 percent as of 2015. In the 2013 World Bank Enterprise Survey, 46 percent of the interviewed manufacturing companies reported power supply as a major constraint to their businesses. In a typical month, power outages can claim an aggregate total of 45 hours which is higher than the 36 hours average of Africa. These outages cause losses which are about 5.5 percent of annual sales (World Bank, 2017). As a result, companies that can afford are investing in alternative power sources such as generators, diverting funds that would have been invested in expanding production (Chandra et al., 2005). According to the World Bank (2017), improvements in electricity supply (reduction of power outages) in Tanzania to the level of the median country in the 2013 World Bank enterprise survey would result in improvement in Tanzanian manufacturing firms' TFP by 3.4 percent (World Bank, 2017). The current electricity generation is far below the demand.

The traditional main recipients of FDI are the mining and manufacturing sectors (BOT, 2014). The majority of the FDIs have however been into the mining and quarrying industry which accounted for 34.3 percent and 42.7 percent of total FDI stocks in 2009 and 2011, respectively (UNIDO, 2014). The manufacturing sector share in total stocks was only 15.3 percent in 2009 and increased to 16.4 percent

in 2013. The mining sector attracted 41.19 percent of the total inflows recorded in the country while the manufacturing sector, which was the second highest, only had 22.5 percent in that same year. In 2013, financial and insurance had was the top recipient of the inflows attracting about 35.3 percent while mining and quarrying, as well as manufacturing, attracted 24.42 percent and 18.14 percent of the total inflows respectively. The share of manufacturing stocks increased from 13.74 percent in 2009 to 16.20 percent in 2013 while that of mining and quarrying declined during the same period.

In 2013, the top sources of FDIs flows were Canada, South Africa, Netherlands, Kenya and the United Kingdom while the major FDI stocks were from South Africa, United Kingdom, Barbados, Canada and Kenya (BOT, 2014). Though still concentrated in a few major countries, the FDI sources are showing evidence of diversification following government efforts to diversify the sources (BOT, 2014). The African Continental Free Trade Area agreement is likely to bring more opportunities for FDIs that are seeking markets as the African regional market becomes more integrated (UNCTAD, 2018). Earlier this year, the URT government introduced the online registration that simplifies investment registration and minimizes time and costs (UNCTAD, 2018). Tanzania should focus on attracting more FDIs in the manufacturing sector as well as in other dynamic sectors.

Expenditures on research and development (R&D) are however lower and growing slowly in Tanzania compared to its partners in the region. Based on WDI (2018) data, R & D expenditures were 0.38 percent of GDP in 2010 and increased slightly to 0.53 percent in 2013. In the same period, Ethiopia increased its share from 0.24 to 0.61 percent. Kenya's share of R&D expenditures in GDP is even higher, recorded at 0.79 percent in 2013. R&D investments are known to bring positive spillovers on economic growth.

As highlighted earlier, education and skills are building blocks for productivity and employment creation. However, in Tanzania, most of the firm owners are young and uneducated. Only 3 percent of the millions that go into business have post-secondary education (World Bank, 2014). The level of skills is still very low (UNIDO 2012; World Bank, 2014). Another issue is the poor quality of education. The skills produced through education at times are not sufficient for the industry

Tanzania will also need to diversify its export markets. Currently, Tanzania enjoys preferential market access to the European Union through the Economic Partnership Agreement (EPA), to the United States through the African Growth and Opportunity Act (AGOA) agreement, to East Africa and Southern Africa through the East African Community and Southern African Development Community (SADC) trade agreements respectively and to China, Canada, Japan and other countries (Lukwaro, 2014).

3.7. Conclusion

The chapter elucidated the recent developments in Tanzania. The economy has grown rapidly since the turn of the new century. The high level of growth has however not driven significant social developments as would be expected. The poverty rate has remained very high and the number of poor

people is increasing. There is also high underemployment which questions the current growth trajectory. A look into the drivers of the recent growth shows that growth fundamentals; macroeconomic stability, investments and good governance have played a major part in Tanzania. The economy, however, suffers from a lack of significant structural change. Tanzania, therefore, needs to accelerate structural change to reduce poverty, create quality jobs and increase incomes. This will require expansion of productive labour-intensive sectors which are either the industry or agriculture.

An analysis of both sectors reveals that the agro-processing sector is much needed in the economy. First, with the growing demand for food in urban areas, the potential of agriculture cannot be fully realised without expansion of downstream activities. On the other hand, except for agro-industries, the majority of the industrial subsectors do not offer opportunities for further value-addition. Industrial policy will need to focus on addressing investment climate challenges, skill shortages, attract foreign direct investments and break into export markets.

Chapter 4: Agro-processing in Tanzania

4.1. Introduction

The previous chapter outlaid the economic history of the Tanzanian economy and identified the need for the development of the agro-processing sector. This chapter gives further details on the current structure and performance of Tanzanian agro-processing and identifies some of the challenges that are impeding the sector's expansion. The first part of the chapter highlights the priority given to the sector in the country's development plans. The subsequent part then follows by discussing the structure and contribution of the sector to the economy. The discussion is then followed by the highlights of the potential role that the sector can play and the challenges that currently limit the success of agro-processing. This discussion is succeeded by a review of the performance of some important subsectors after which a conclusion on the chapter is drawn.

4.2. Policy context

The development of the sector is accorded priority in various national development plans (URT, 2017) highlighting its critical role in the Tanzanian economy. The Tanzania Development Vision 2025 identifies the need to transform from low productivity agricultural-centered to a diversified, highly productive, semi-industrialised, and competitive economy through local-based agro-industries (URT, 1999). The Integrated Industrial Development Strategy (IIDS) which was prepared as a plan of action towards meeting the TDV 2025 and SIDP goals places emphasis on food and non-food agro-processing industries (MITI, 2016). The current five-year plan (FYDP II) of the LTPP accords priority to agro-processing activities and a significant portion of the plan's budget is directly allocated to initiatives to expand these industries (URT, 2016a). The plan highlights that SMEs, especially in agro-processing, should be accorded higher priority in light of their job creation potential.

Agricultural development plans also emphasize the need for expansion of processing activities. In the Agriculture Sector Development Program (ASDP) 2, the agro-processing sector is recognised for its potential to "generate employment, raise productivity, transfer skills and technology, increase competitiveness, substitute imports and enhance exports, and contribute to the long-term national economic development" (URT, 2016b). According to URT (2011), agro-processing activities are an essential part of agricultural commercialization and transformation. The Kilimo Kwanza resolution to accelerate agricultural transformation also underlines the need to establish agro-industries to provide linkages for primary agriculture as well as increasing local and foreign market access for value-added products.

The agro-processing sector is one of the most targeted sectors in the Special Economic Zones (SEZs) and Export Processing Zones (EPZ) programmes. The establishment of the Special Economic Zones (SEZs) is a major part of the policies to stimulate investment, both local and FDIs, in agro-processing activities.

In 2010, the agro-processing sector accounted for 46 percent (3 per cent in meat sector) of the investments in SEZs (Kinyondo et al., 2016). The EPZ on the other hand were established with an emphasis on export-led industrialisation and enhancing value-addition through processing of domestic raw materials for exports (EPZA, 2016). The EPZs are also viewed as crucial for technology transfers (EPZA) which are important for productivity increase in the sector. Some of the incentives to attract investments in EPZ/SEZ include exemptions from paying corporate taxes and duties on capital goods, remission of custom duties, value-added tax and other taxes paid on raw materials and capital goods used in the SEZ and access to an export credit guarantee scheme for exporters subject to certain conditions. The government is also accelerating construction of roads, ports and hubs to improve trade logistics (URT, 2016a).

4.3. Overview of the Structure and sector's contribution

Like in many developing countries, agro-processing constitute the majority of the manufacturing activities in Tanzania. Out of the 49,243 industrial establishments in the 2013 Census of Industrial Production (CIP), agro-processing comprised 35,804 establishments (NBS and MITI, 2016). The structure of the firms in agro-processing is no different from the rest of the manufacturing activities with small and medium scale firms constituting the majority of the establishments in the sector. Food processing makes up the largest percentage of agro-processing establishments followed by wearing apparel (NBS and MITI, 2016).

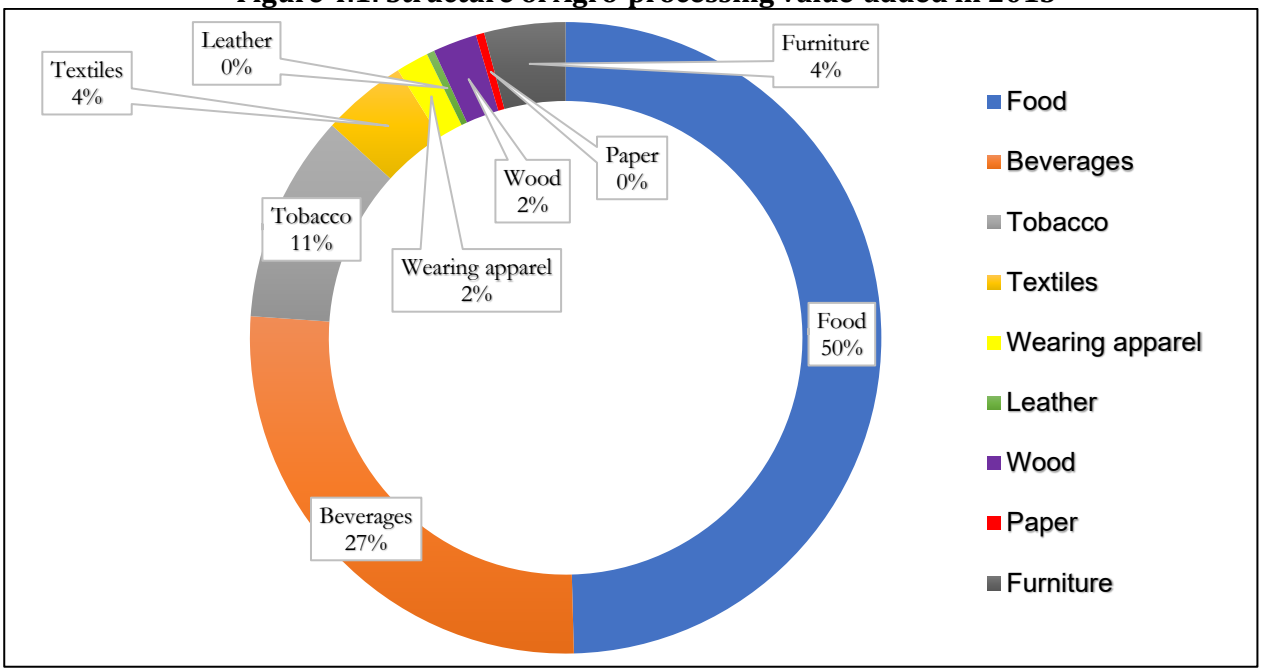
Though the sector is mainly composed of small establishments, its contribution to the economy cannot be underestimated. The sector contributes about 3.76 percent of the economy's total GDP which is more than half of the total manufacturing sector's contribution. In the 2013 CIP, the agro-processing activities contributed a total of about TZS[5] 3,849,067 million in valued-added (NBS and MITI, 2016). The food and beverage subsector accounts for about three-quarters of the sector's output with tobacco and textiles making a greater share of the contribution of the non-food sector (Figure 4.1).

Agro-processing activities also play a role in employment and incomes in the Tanzanian economy. In 2014/15, the sector directly employed about 1.2 percent of the total working-age population (Yeboah and Jayne, 2018). This share is, however, smaller compared to other regional counterparts such as Zambia and Uganda which are also in the low-income group. However, the sector also has indirect effects on employment in other sectors such as input sectors, food services, and trade and transport. While the actual total employment figures are not available, the 2013 CIP shows that the 35,804 establishments in the survey employed a total of 126,783 workers. The total number of people engaged in the activities was even higher as it includes part-time and unpaid family labour (Table 4.1). Except for the textiles,

[5] TZS is the local currency, the Tanzanian shilling. As at 30 June 2017, US$ 1 was equivalent to TZS 2,230.1 (BOT, 2017)

paper and tobacco industries, the small firms played a greater role in employment and accounted for more than a third of the total employment in each industry

Figure 4.1: Structure of Agro-processing value-added in 2013



Source: Author's compilation based on the 2013 CIP (NBS and MITI, 2016).

Table 4.1: Employment in the agro-processing activities by establishment type in 2013

Industry	Establishment size (Number employed)								Total engaged
	1-4	5-9	10-19	20-49	50-99	100-499	500+	Total	
Food	18,565	6,437	1,938	2,991	2,424	9,168	22,340	63,863	85,330
Beverages	24	87	96	362	558	4,384	1,408	6,919	7,004
Tobacco	6	37	0	0	0	122	4939	5103	5,109
Textiles	546	138	43	159	244	3,214	12,305	16,649	17,714
Wearing apparel	6,235	2,500	52	140	86	137	1,302	10,453	30,538
Leather	117	164	43	192	413	480	0	1,410	1,726
Wood	1,764	1,775	514	375	353	147	2,281	7,209	9,418
Paper	3	18	12	149	305	248	1,507	2,242	2,253
Furniture	5,533	4,569	327	268	689	1,550	0	12,935	23,739
Total processing	**32,793**	**15,725**	**3,025**	**4,636**	**5,072**	**19,450**	**46,082**	**126,783**	**182,831**

Source: Based on the 2013 CIP Report (NBS and MITI, 2016)

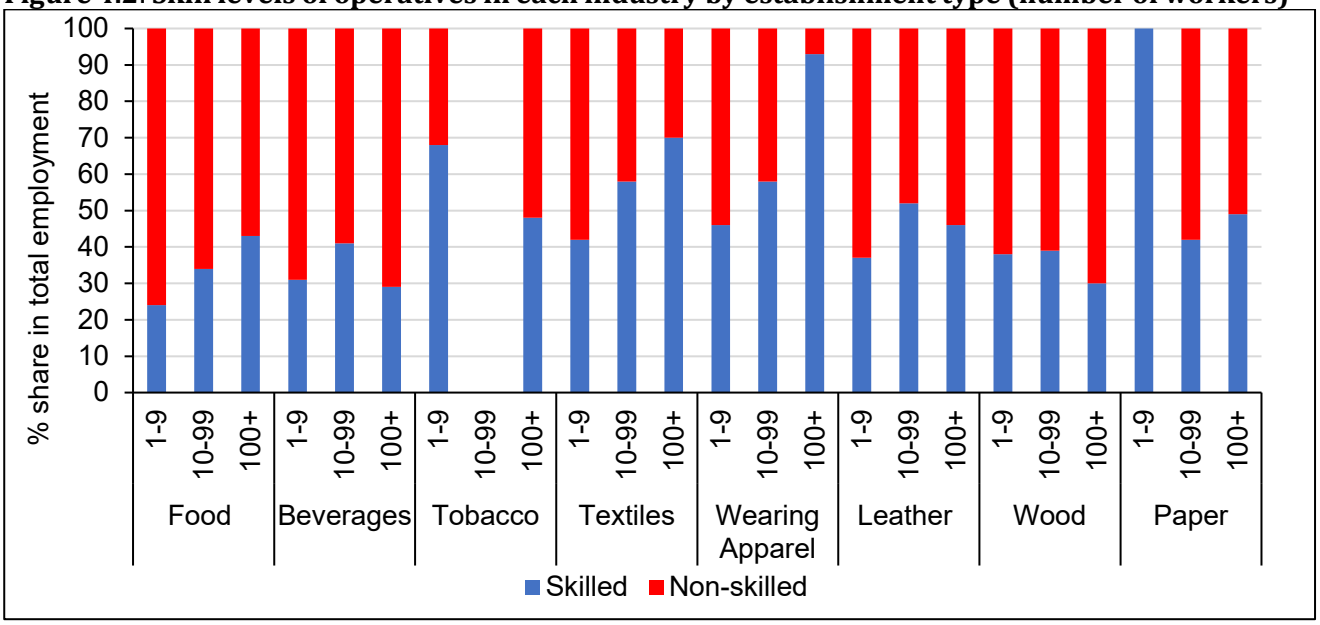
The sector absorbs a high number of non-skilled and moderately skilled labour. Figure 4.2 shows the composition of skills in the agro-processing industries. The level of skills, however, differ per industry

and between small and large establishments. The textiles and wearing apparel industries have more skilled operatives than non-skilled. In other industries, unskilled labour makes above 60 percent of the total production employees. In general, the level of skills is higher in large establishments.

The sector also has a significant role in exports. The processed products contribute a considerable share of total agricultural exports, especially processed foods. For example, palm oil is among the top 10 exported agricultural exports. Between 2012 and 2016, processed food exports grew by an annual rate of 4.6 percent while imports grew at an annual rate of 3.9 percent which helped the country's progress in closing the food trade deficit (Paremoer, 2018). However, the trade is more skewed towards palm oils (Paremoer, 2018).

Agro-industries provide important linkages in the Tanzanian economy. From the 2013 Census of Industrial Production (NBS and MITI, 2016) the agro-processing sector plays a significant role as a consumer of products from agriculture, services and other industries. Apart from these backward linkages, the processing activities also form important forward linkages with industries down the value chain. The food sector has strong forward and backward linkages with agriculture. For example, grain milling offers an additional market for staple crop producers and it supplies feed to the livestock producers. The non-food industry is small but has a huge potential of expansion.

Figure 4.2: **Skill levels of operatives in each industry by establishment type (number of workers)**



Source: Own compilation based on 2013 CIP (NBS and MITI, 2016)

4.4. Future prospects

The agro-processing sector has a huge potential to drive structural transformation in the East-African country. The World Bank (2017) emphasized that the Tanzanian economy has the potential to create labour-intensive manufacturing by adding value to agricultural products.

Dorosh and Thurlow (2014) highlighted that agro-processing in Tanzania absorbs more of the less-educated workers compared to other regional countries such as Mozambique and Uganda, where the sector is more capital and skill intensive. The sector thus presents an opportunity for accelerating structural change by absorbing labour that might have been stuck in the subsistence agricultural sectors due to lack of skills. The sector is also important for providing learning by doing opportunities for the less-skilled labour. Expansion of agro-processing activities is also important in reducing the high rate of youth unemployment and underemployment. In their study on employment opportunities in the agri-food system, Yeboah and Jayne (2016) found that Tanzanian youth perceive employment in food manufacturing as more attractive than in other sectors in the food system.

With the growing incomes and rapid urbanization, the opportunity cost of time increases and the demand for processed products also increases. However, Snyder et al. (2015) found that the income elasticity for processed foods in Tanzania is elastic, both in urban and rural areas, implying that with the growing incomes the demand for such products will increase not only in urban but also in rural areas. The share of processed foods in total food expenditure is as high in rural areas as it is in urban areas.

It is, however, important to note that the trends in local demand signify the need to shift from minimal processing to higher value-added products. The country, however, continues to export raw agricultural commodities while the agro-processing industry is not meeting local demand (URT, 2011) leaving the growing demand to be met through imports. By exporting these raw and semi-processed products, Tanzania loses opportunities for increased value addition that would result in more decent jobs and income. Thus, the country continues to export its economic value and jobs (Scholtes 2018).

Agro-processing can also play a greater role in exports beyond its current position. Currently, agro-processing exports are limited, and at most in semi-processed form (UNIDO 2012). The demand for agro-processing products is not only growing within the country but also across the region and other continents. Tanzania is well favoured by its position at the coast which gives it easy access to international markets. The prospects of the continental free-trade area also present a huge market for Tanzanian products. Necessary measures must be implemented to exploit these opportunities.

Several factors need to be addressed to ensure that the potential of the sector is realised. The following section highlights the several challenges that limit the progress of the sector.

4.5. Overall challenges of the agro-processing sector

As highlighted in the previous chapter, the investment climate and infrastructure bottlenecks in particular, need to be addressed to ensure successful industrialisation in Tanzania. Challenges of insufficient water and power supply and poor transport facilities which leads to high transport costs, limit the expansion of agro-processing. Such issues are cited to cause the underutilization of production

capacity (NBS and MITI, 2016). Apart from the investment climate issues, the following factors also have an influence.

Investments in the agro-processing sector are limited. Inadequate investment in agro-processing has resulted in a mismatch between agricultural production and food products demanded in the market by consumers especially in urban areas. The sector lacks enough processing capacities and as a result, half of the crops produced in the country are spoiled (OECD, 2013). Inadequate agro-processing facilities result in the loss of 20, 30 and 70 percent of fish, cereals and fruit and vegetables, respectively (URT, 2011). The limited investments have thus led the country to mainly export raw agricultural products rather than processed products with more high value. Paremoer (2018) indicated that the country's imports of processed agricultural products will grow far above exports if investments in the sector do not increase.

In addition, most of the small-scale processing technologies are backward resulting in low productivity (Jahari et al., 2018). Productivity improvements in agro-processing are essential for stimulating exports for processed agricultural products (Fukase and Martin, 2017). Investments in capital and technology, however, determined by the availability of funds (World Bank, 2014). Despite the various efforts to improve financial services, access to formal finances is still limited (TNCFI, 2014). Only 8.5 percent of the rural population has access to formal finances as compared to 23 percent in urban areas. In addition, 60 percent of the rural population is completely excluded from financial access (GAFSP, 2016). This has been seen as limiting the agro-processing sector (GAFSP, 2016; Dalberg, 2017) which is dominated by small and medium enterprises. A survey in 2011 showed that only 32.4 percent of the agribusiness SMEs had access to formal financing, 13.3 percent accessed informal financing while the remaining 54.3 percent were totally excluded from both formal and informal financial services (TNCFI, 2014).

The agro-processing sector also suffers from poor and unreliable supply from the small-holder farmers (Dalberg, 2017). Supply is often in poor quality or not enough, leading to underutilization of the agro-processing capacity (NBS and MITI, 2016).

The excessive regulatory framework is another main challenge faced by formal food processors (CTI, 2015; GAFSP, 2016). To meet food safety, nutritional and health standards, among other goals, the government imposed several regulations the food manufacturers must comply with. The processors need several licenses before commencing operations. Consequently, the processing sector is now under more than fifteen regulators with duplicated regulatory functions, charging multiple fees and delaying business due to bureaucracy. Corruption has also been recorded among these regulators. The regulations have increased the cost of doing business in the formal sector and a considerable number of small processors are lost into the informal sector each year (CTI, 2015).

While the sector can be applauded for absorbing employees with limited skills, insufficient skills also limit the expansion of the sector (Dalberg, 2017). Sectoral upgrading and further value-addition beyond semi-processed products will require more skills than the current position of the sector.

Encouraging agro-processing will require "both a productive private sector that has more capacity to export and an enabling business environment that ensures a reliable power supply, access to credit, a skilled labour force, and a lower regulatory burden" (World Bank, 2017).

4.6. Subsector performances

The previous sections outlaid the structure, potential and challenges of the whole agro-processing sector in Tanzania. The magnitude of the challenges and opportunities may differ across sectors. This section reviews four subsectors, two food and two non-food industries, which are part of the 15 subsectors that are included in the model in the next chapter. These sectors are highlighted among priority sectors for policy intervention in the FYDP II (URT, 2016a).

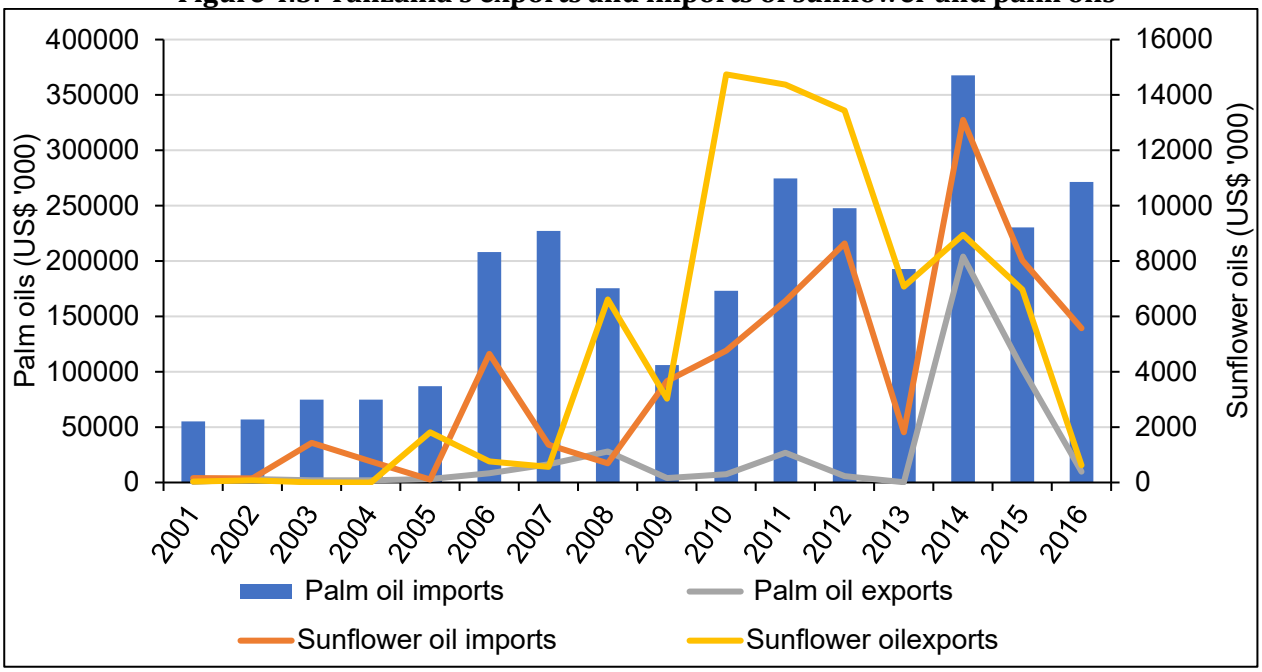
4.6.1. Edible Oils Industry

The edible oil industry is another major industry in the country's development plans. The successful development of the oil industry can benefit many farmers involved in the production of oil crops. The 2016/17 annual agricultural sample survey report shows that a total of 25,773 farmers were engaged oil palm production; 661,718 in sunflower; 1,126,601 in groundnuts and 38,269 produced sesame. The country's production of oilseeds has been rising over the past years. Calculations from FAOStat (2018) show that average annual growth of sesame, sunflower, and groundnuts has been 53, 45 and 32 percent respectively while palm fruit and soybean production were 2 and 8 percent respectively. This might be due to the continued government support for the sector through its development strategies. Sunflower is the most produced oilseed and at the core of edible seeds development plans as outlined in the Tanzania sunflower development strategy 2016-2020 (ITC, 2016a).

Despite the increased output of oilseeds, processing of seeds into oils is still limited. The production of oils has not changed much over the past years except for sunflower and sesame oils whose output has dramatically increased. Production of sunflower oil rose from 76,230 to 152,850 tons between 2009 and 2014 while sesame oil production increased from 19,228 to 544,293 tons in the same period (FAOStat, 2018). Nevertheless, production meets only 40 percent of the local demand and the remainder is satisfied through imports (Kombe et al., 2017). Tanzania is thus a net importer of edible oils. Figure 4.3 shows trade in sunflower and palm oils. The majority of seed oil imports are palm oils and they have shown a growing trend over the past years, from US$ 55,095 in 2001 to US$ 271,380 in 2016. Paremoer (2018) highlights that palm oil imports constitute above half of the country's food imports. Soybean oils are also highly imported. Palm oils also have relatively higher exports as compared to other oilseeds.

The sunflower oil industry which is the main targeted subsector to expand Tanzania's oil production (ITC, 2016a) has not exported as much oils and has become a net importer in recent years (Figure 4.3).

Figure 4.3: Tanzania's exports and imports of sunflower and palm oils



Source: ITC Trademap (2018)

Several factors have led to the underperformance of the edible oil subsector. Jahari et al. (2018) note that most of Tanzania's oil processors are small-scale farmers with backward technologies and often produce unrefined oils for the local informal market. As a result, yields are below standards. For example, Kombe et al. (2017) indicate that a 65 kg bag of sunflower seeds produces between 18 and 22 litres of cooking oil which is below the global average of 30 litres. The crude oil produced does not comply with the Tanzanian Bureau of standards (Kombe et al., 2017).

Other factors limiting the industry are lack of adequate processing technology and facilities and power outages. In addition, machines often break down causing delays as the processors do not have the technical skills to fix the machines (Paremoer, 2018; Jahari et al., 2018). Raw material shortages are also experienced but lack of access to finances is often the root cause. The small and medium-scale processors mainly finance themselves through informal means (Kombe et al., 2017). The country can benefit if these challenges are addressed. Investment in the industry is required.

4.6.2. The Sugar Industry

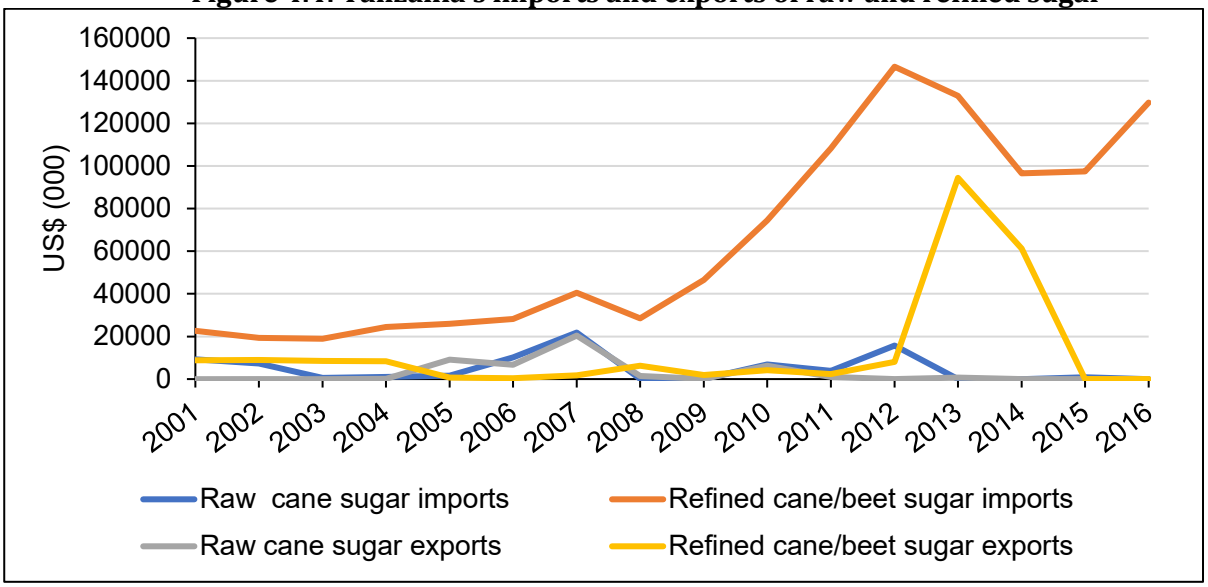
The sugar industry is one of the priority sectors identified in the Big Results Now and the FYDP government programs. The industry directly employs about 30,000 people and further supports hundreds of thousand people in related businesses (Sulle, 2017). Sugar cane is an important cash crop in Tanzania and is converted into sugar in several plants across the country (Nkonya and Barreiro-Hurle, 2012). The crop is produced by estates and outgrowers who supply their product to factories in the

eastern, northern and north western regions of the country. Sugar produced is for final consumption or industrial use in the local and export markets.

At present, there are four commercial sugar processors in Tanzania: Kilombero Sugar Company (KSC) and Mtibwa Sugar Estate (MSE), located in Morogoro Region; Tanganyika Planting Company (TPC) in Kilimanjaro region; and Kagera Sugar Limited (KSL) in Kagera region. The industry was liberalized in the early 1990s and the companies were privatized at the turn of this century. The government however retained a quarter of the stakes in KSC and TPC. According to TanzaniaInvest (2018), KSC has 40 percent market share, TPC 34 percent, KSL 17 percent and MSE 9 percent. Only TPC solely processes sugar from its own estate, the other companies have outgrowers on top of their estates. Since privatization, raw cane and sugar production, as well as the number of outgrowers, have increased (Nkonya and Barreiro-Hurle, 2012). Production has however not been able to meet the local demand. With annual sugar production currently around 300,000 tonnes, the demand gap of over 200,000 tonnes (URT, 2016a) is fulfilled by imports.

Figure 4.4 below shows Tanzanian trade in raw and refined sugar. Much of the imports have been refined sugar. Refined sugar imports increased from around US$ 20,000 thousand to US$ 40,000 thousand between 2001 and 2008 but increased more rapidly since 2008. In 2016, the imports of refined sugar were US$ 129,696 thousand. The local producers suffer from competition from cheap imports. Sulle (2017) highlighted that the government issues sugar importer permits but often the quantity allowed exceed the deficit in sugar. The country, however, has the potential to expand its production to meet its own demand (URT, 2016a).

Figure 4.4: Tanzania's imports and exports of raw and refined sugar



Source: ITC Trademap (2018)

There is also a growing regional demand for sugar and confectionery which averaged a 9.9 percent growth rate between 2000 and 2015 (BFAP, 2017). By expanding its industrial capacity, Tanzania can

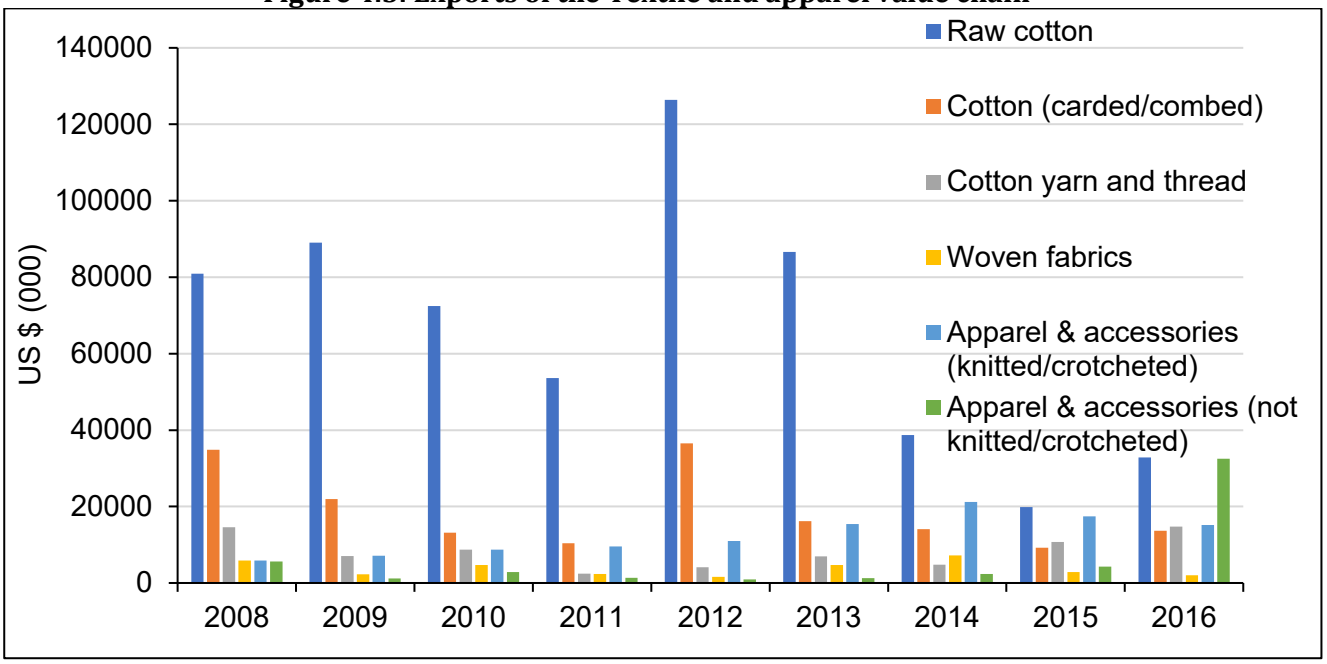
seize these opportunities. The government's FYDP focus is to increase sugar production through the Bagamayo processing plant project (URT, 2016a). However, the FDI that had the task to carry out the project quit operations in 2017 following a dispute over the land (EcoEnergy, 2018). There is, therefore, a need to invest in sugar processing.

4.6.3. The Textile to Garment Industry

The cotton-to-garment industry is very labour-intensive and has often been an entry point for industrialisation in many economies (MITI, 2016). The value-chain is long and, except for textiles, at each additional processing stage, the product increases its price (Dinh and Monga, 2013; URT, 2016b). Dinh and Monga (2013) highlight that Tanzania has the potential to compete globally in textiles and apparel products. However, the country is mainly exporting raw and carded/combed cotton (Figure 4.5). Tanzania has the potential to expand its industry through exports to USA through the AGOA agreement, but it has not exploited many of the opportunities.

The country is among Africa's top cotton producers and has the textile milling capacity, but the two sectors are disconnected (GDS, 2011). Garment manufacturers often have their own fabric mills. Local mills' supply to the garment producers is limited as they often supply poor quality thus leading to exports of lower value-added products and imports of high-value products. However, production and exports of apparel and yarn are more attractive to the EAC and global market respectively (EAC, 2017). There are also lack of skills in the industry, especially in garment making. However, the government entered into an agreement with two companies to train 3,000 people in garment manufacturing under the National Skills Development Programme (TDU, 2018).

Figure 4.5: Exports of the Textile and apparel value chain



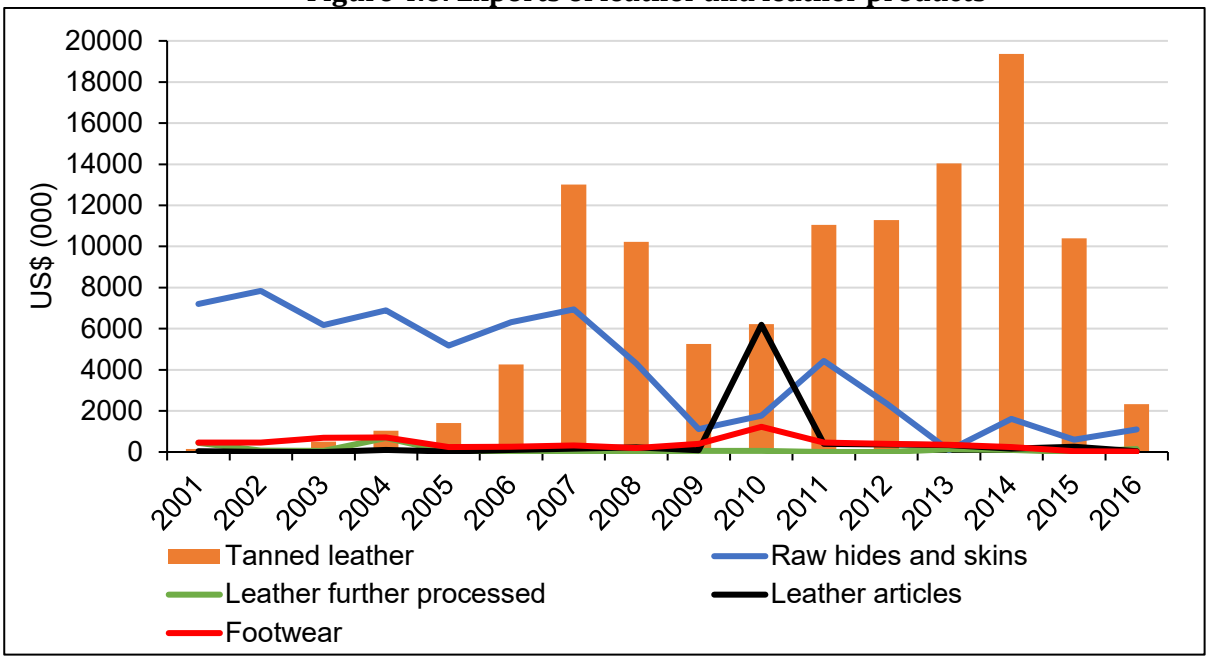
Source: ITC Trade map (2018)

4.6.4. The Leather Industry

The leather industry is among the prioritised sectors in the IIDS. Tanzania ranks among the top three largest producers of livestock in Africa (MIT, 2011) implying there is a significant input base for the leather industry. Dinh and Monga (2013), however, note that the value chain is broken with limited investments downstream. The leather value chain was vertically integrated and robust during the state-led industrialisation (Dinh and Monga, 2013; DAI, 2016). However, the leather industry has not performed according to the expectation since its privatization (ITC, 2016b; URT, 2016). Most of the products are in raw or semi-processed form and of lower value and quality than that of competitors. Exports of these products are mainly to India, China, Italy, Pakistan, and Turkey (ITC Trade map, 2018).

The country has a total of seven tanneries tanning raw hides into semi-processed (95 percent) and finished leather (Dinh and Monga, 2013). Diversification is, however, underway as seen in the shift from merely exporting raw leather exports to increasing tanned leather exports. However, further diversification to high-value leather articles and footwear has not yet taken place (Figure 4.6). The low degree of diversification over the last decade reflects weak technology adoption, limited access to finance and a number of supply-side constraints (ITC, 2016b). Tanzania is a net importer of high-value leather products and its imports have expanded over the years. Investments are thus needed in the production of high-value leather products.

Figure 4.6: Exports of leather and leather products



Source: ITC Trade map (2018)

4.7. Conclusion

The development of the agro-processing activities has been prioritised in various development plans in Tanzania. As reviewed in the chapter, these manufacturing activities have the capacity to generate additional employment and incomes in the Tanzanian economy. Because the activities are labour-

intensive and can accommodate moderate skills, they are vital for driving structural transformation by drawing out labour that might remain trapped in the low-productive subsistence agricultural sectors due to low skills. Despite the great potential, the sector is currently underperforming due to a number of reasons, which include low investments, low productivity, limited skills, lack of access to finances, poor infrastructure especially electricity supply and excessive regulatory framework. Investments in the sector will need to increase to unleash the potential of the sector.

Chapter 5: The Model and Data

5.1. Introduction

A number of policy strategies are available for Tanzania to expand its industry as highlighted in the previous chapters. This chapter gives the methodology used to study the ex-ante effects of the policies on agro-processing and the rest of the economy. The chapter first provides an overview of the recursive dynamic computable general equilibrium (DCGE) model and the dataset – the Tanzanian Social Accounting Matrix (SAM), used in this study. A brief outline is later given on the policy strategies explored and how the shocks are implemented in the model.

5.2. The IFPRI recursive dynamic computable general equilibrium model

The recursive dynamic CGE model has two components, the "with-in period" module and the "between period" module, with the latter capturing the recursive dynamics of the model. The static component of the model is solved first while the between period module provides the parameters needed for the model in the next periods (Lofgren and Robinson, 2008). The following section will describe the model discursively even though the model is expressed as a set of linear and non-linear equations.

5.2.1. The Within-Period module (Static Model)

The within-period is a one-period static model developed by Lofgren et al. (2002). The with-in period has different functions that model the behaviour of the institutions relating to production and consumption decisions on traded and domestic goods. The discussion of the model follows Lofgren et al. (2002).

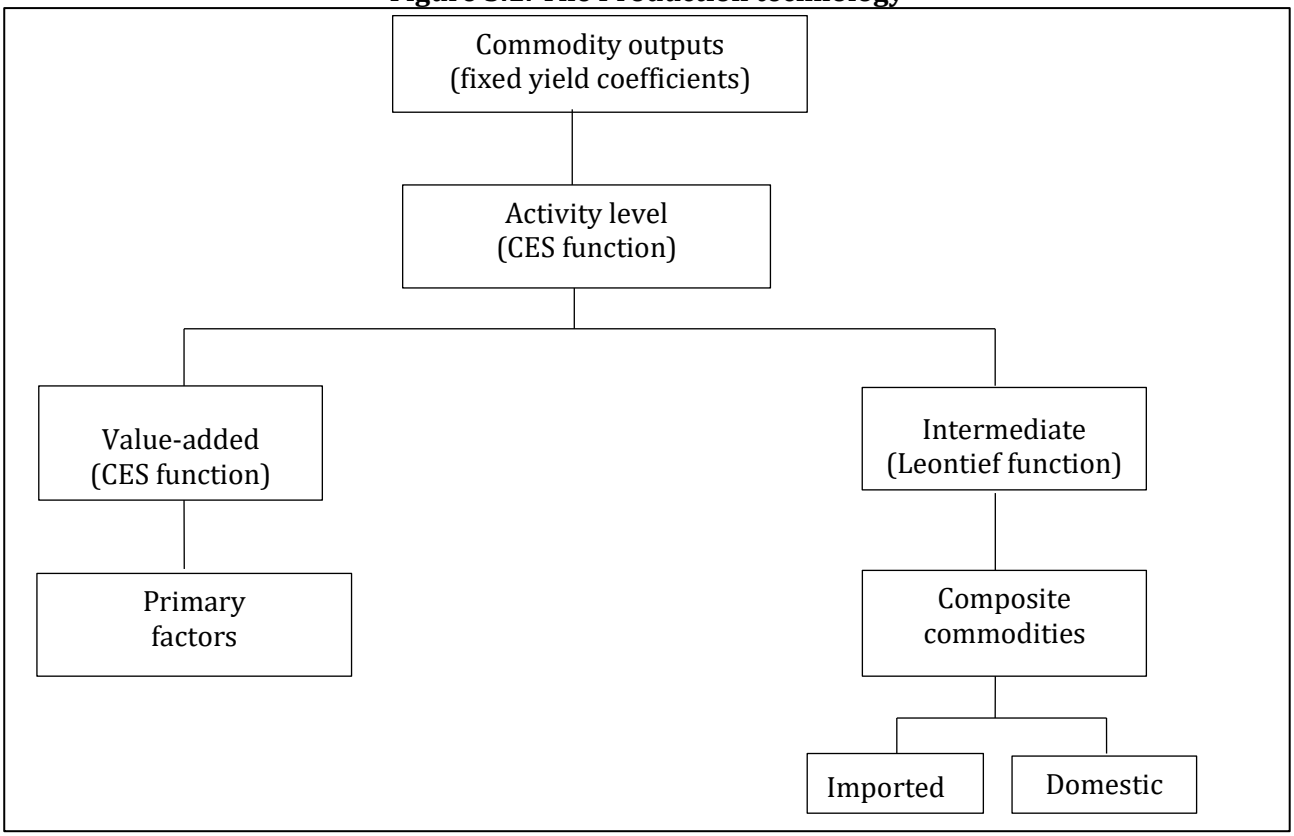
5.2.1.1. Production and factor markets

The model identifies various activities that produce their final output using a combination of primary factors and intermediate inputs, to maximize profits subject to a production technology illustrated in Figure 5.1. The production technology is referred to as a nested production structure and allows the degree of substitutability among the inputs to vary. At the bottom level of the nest, the aggregation of primary factors (labour, capital, land) into value-added is governed by a constant elasticity of substitution (CES) function. This means producers can respond to changes in relative factor prices by substituting between the available factors. To maximize profit, a factor is used such that the marginal revenue product of the factor is equal to its wage rate. The disaggregated intermediate inputs, on the other hand, are used in fixed proportions to produce the aggregated intermediate inputs.

At the top nest (activity level), the technology allows intermediate inputs and the aggregated primary factors (value-added) to be combined either in fixed proportions (specified by Leontief function) or alternatively defined as a CES function. In this study, the CES function governs the aggregation of value-added and intermediate inputs.

The model allows for multi-product activities; each activity can produce one or more commodities, and this is according to fixed yield coefficients. The revenue is thus a function of yields, activity level and producer prices of the commodities. The price of the activity's output is depended on the price of value-added, intermediates plus any government taxes or subsidies per unit of that output.

Figure 5.1: The Production technology



Source: Lofgren et al. (2002)

To attain a solution, the model requires equilibration of demand and supply in the factor and commodity markets. This equilibrium is determined by the interaction between endogenous and exogenous prices, and the influence of relative price shifts on sectoral production and employment, and consequently institutions' incomes and demand (Thurlow, 2008). There are three alternative closure rules for factor markets that govern behaviour and ensures equilibrium. Under the first option, the quantity supplied of the factor is fixed - the factor is fully employed and mobile across sectors. The economy-wide wage adjusts to ensure the market equilibrium. The activity-specific wage is a product of economy-wide wage and activity-specific distortion term. This distortion term is fixed in this first closure. The second alternative closure assumes that the factor market is segmented such that an activity is forced to employ all the base year quantity. In other words, the factor is activity-specific. The economy-wide wage and the quantity of factor demand for the activity are fixed while the specific wage distortion and the factor supply is flexible. This closure is mainly desirable where there are significant quality differences among the factors. Under the third closure, unemployment in the factor market is allowed; the quantity of the factor supplied adjust while the nominal wage is fixed. An activity is free to employ any quantity of the

factor at the given wage and the supply adjust to meet the demand. This closure is most appropriate where the unemployment level of a factor is significant. The model allows for different closure choices among the different categories of a factor, for example, unemployment for unskilled labour while skilled labour is fully employed.

Given the prevalence of high underemployment in Tanzania, the supplies of uneducated and primary-educated labour are assumed to be unlimited, and the labour is mobile across sectors. On the other hand, more educated labour is assumed fully employed and mobile, while capital is specified as activity-specific. Land is initially assumed to be fully employed and mobile. However, Tanzania still has vast areas of unutilized arable land. The assumption that land is fully employed is thus dropped later to test the sensitivity of the model.

5.2.1.2. Commodity markets

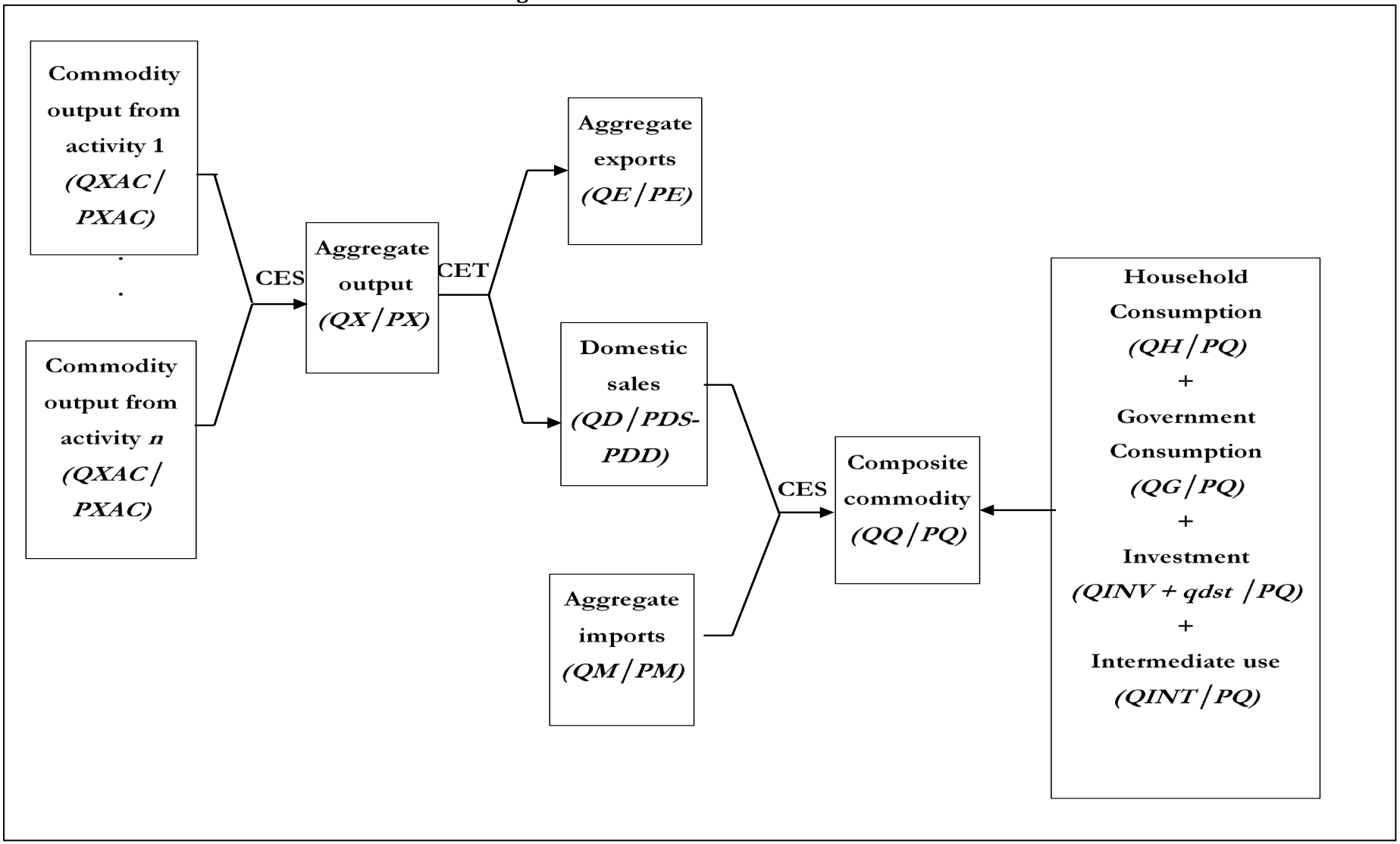
The total quantities of output from each activity are allocated between marketed output and home consumed output. Figure 5.2 shows the flow of marketed commodities, illustrating the relationship between the quantities and prices of all commodities that enter the market.

The domestic marketed output goes through various stages before final consumption. At the first stage, the commodity output from each activity is aggregated together across the different activities to give the total domestic production of a commodity. Imperfect substitution exists between these outputs. A CES function governs their aggregation. This allows demanders with a motive to minimize their costs to choose between the different suppliers of the commodity.

In the second stage, the total domestic output is allocated between the domestic market and the export market. The rationing of this product between the two markets is subject to imperfect transformability between domestic sales and exports and is directed by a constant elasticity of transformation (CET) function. The profit-maximizing producers will, therefore, allocate their products to the market with the highest return, which is determined by the domestic and export prices. The demand for exports is assumed to be perfectly elastic at fixed world prices. The export price is calculated as the world price multiplied by the exchange rate and adjusted for transaction costs (to the border) and any taxes. The price received for domestic sales is the price paid by local consumers, less domestic transaction costs per unit of sales.

The domestically produced commodities, not exported but supplied to the local market, are aggregated with imported products into a composite commodity. Imperfect substitutability exists between imported and domestic goods.

Figure 5.2: The flows of marketed commodities



Source: Lofgren et al. (2002)

The demanders for these commodities aiming to minimise costs are guided by the CES Armington function. Armington elasticities vary across sectors; sectors with low elasticities show greater differences between imported and domestic goods. The country is assumed to face a perfectly elastic supply of imports at a given world price. The price paid by locals for the imported goods will also include the import tariffs and transactions costs per unit of moving the imports from the border. Likewise, the price paid by the demanders for locally produced goods include the domestic transaction costs of moving the good from the local supplier to the local demander. The total demand of the composite commodity consists of investment demand, intermediate demand, government consumption and household consumption.

5.2.1.3. Institutions

There are four types of institutions in the model: households, enterprises, government and rest of the world (ROW). The households (disaggregated in the SAM) own some factors of production and thus receive factor incomes that are proportional to the share of each factor stock they control. They also receive transfers from other institutions. The household incomes are transferred to other institutions, used to pay direct taxes or and /or saved, and the remaining income is consumed. Household consumption is allocated across both the marketed and home commodities guided by Linear expenditure system (LES) demand functions, derived from the maximization of a Stone Geary utility function.

Enterprises also receive factor incomes and transfers from other institutions and spend their incomes in a similar way to households except that the enterprises do not consume. Instead of consuming, enterprises invest. Excluding this exception, payments to and from enterprises are modelled like those of households.

The government receives income from taxes and from transfers from other institutions and uses it for consumption and transfers to other institutions. Government consumption is fixed in real (quantity) terms whereas government transfers to domestic institutions are CPI-indexed. The difference between government incomes and spending, government savings, is a flexible residual. A budget deficit is financed through borrowing.

The final institution is the rest of the world (ROW). Transfers exist between the ROW and local institutions (government, households and enterprises) and these transfers are fixed in foreign currency. The difference between the foreign savings and receipts is the foreign savings or current account.

5.2.1.4. Macro-economic closures

There are macro closure rules that are specified in the model to govern the macroeconomic behaviour to ensure equilibrium with regards to the three macroeconomic accounts; the current account balance, the foreign account, and the savings-investment (S-I) account. For each account, a set of alternative closures exist but the emphasis here is given to the model specification. For the government balance,

the revenue from taxes is based on fixed tax rates. Government savings, therefore, adjust to maintain the fiscal balance - they are treated as a flexible residual.

In the current account balance, the ROW closures serve to equate the country's spending and its foreign exchange earnings. Under the chosen closure, the exchange rate is assumed to be flexible and it adjusts to maintain a fixed level of foreign savings. The external balance is fixed in foreign currency. This is more applicable to Tanzania which maintains a flexible exchange rate. The level of foreign savings is however increased in the base year to account for productivity increases emanating from foreign direct investments in simulation 1 as explained in section 5.5.

In the closures for the S-I account, either the value of savings adjusts (investment-driven) or the level of investment adjust (savings-driven) to ensure equilibrium between savings and investment. A balanced closure, a variant of the investment-driven closure, is chosen for the analysis. Under this closure, changes in absorption result in simultaneous adjustments in all three components of absorption (households, government and investment). The savings rates of selected institutions are scaled to ensure enough savings for investments. The alternative closure used to test the sensitivity of the model is a savings-driven investment closure. Under this alternative closure, the households' marginal propensities to save are assumed fixed and thus income increases result in higher levels of savings and investment.

The model's numeraire is the domestic producer price index.

5.2.2. The Between-Period module (Recursive Dynamic Model)

The "within-period" module explained above is a portrayal of the economy within a single time period. Its ability to capture the full effect of policy and non-policy changes is hampered as the model cannot account for considerations in following periods. For example, the static model cannot capture the effects that investments in the current period have in the subsequent capital stock of the next period. The static module is thus extended to a recursive dynamic model to overcome these limitations. The module has various equations that update some variables in the static model between the periods based on trends from previous periods and external trends. The mathematical expressions are found in Thurlow (2004; 2008).

Updated exogenously are stocks of the labour force, government consumption, and population and productivity growths. The parameter values assumed in the exogenous update of these variables are detailed in the baseline scenario in section 5.5.

It is assumed that the additional population increases consumption demand and thus household consumption level. The additional consumers are assumed to have the same preferences in consumption of commodities as the already existing consumers. The entry point of population growth

in the model is its direct effect of increasing private consumption spending. To account for this effect, the quantity of income-independent demand (γ_{ch}^{m}) is equated to the population growth rate in the household consumption spending equation. An increase in population will thus result in an upward, parallel shift of the consumption spending demand curve.

To update the changes in TFP, the exogenous increase in productivity is multiplied by the efficiency parameter in the CES value-added function.

Government payments can be exogenously increased between the periods by increasing the value of the base-year quantity of government demand in the case of government spending. In the case of government transfers to households, and the parameter representing transfers from government to other institutions is exogenously increased.

Accumulations of private and government capital, as well as the flow of foreign capital, are endogenously determined. The stock of capital for each period is based on stocks from the previous period, new investments and the depreciation rate. In addition, the stocks are sector-specific and the new capital stock is distributed amongst the various sectors according to the sector's share in the capital as well as its profitability in the previous period. The more profitable the sector is, the higher is its share in the new capital stock (Lofgren and Robinson, 2008; Thurlow, 2004, 2008; Sennoga and Matovu, 2013).

5.3. Elasticities

Elasticities used in CGE models should be exogenously determined by means of econometric analysis. In this study, no econometric estimates were done as there is a paucity of related statics needed to estimate the parameters for this country (Laborde and Traore, 2017). Due to the lack of econometric estimates, previous studies on Tanzania (Fukase and Martin, 2017; Laborde and Traore, 2017) used the readily available Global Trade Analysis Project (GTAP) elasticities. The challenge is that the GTAP parameters are calculated using statics from a range of countries. Rather than using the GTAP parameters, the elasticities used to calibrate the model in this study were those applied by Schuenemann et al. (2016) for a study on Malawi. Though based on GTAP parameters, Schuenemann et al. (2016) adjusted some of the production, income and trade elasticities to reflect the Malawian economy characteristics. Considering that Malawi and Tanzania are both in the SSA region and have comparable income levels, the parameters by Schuenemann et al. (2016) are thus more appropriate for use on Tanzania.

Concerning production, the parameters for the top and the bottom technology nest are the same for each activity. Factor substitution is high among agricultural activities with a CES value of 1.5 while a low degree of factor substitution is assumed for the non-agricultural activities (CES value of 0.5).

The consumption levels of households for both marketed and home-produced commodities are governed by the linear expenditure system (LES) of demand. The income elasticities for both types of commodities are assumed to be the same in this study as was done by Lofgren and Robinson (2008). The elasticities vary per commodity and across household categories. The income elasticity of demand for agricultural commodities range between 0.05 and 2.08 for both the rural farm and non-farm households while that of urbanites range from 0.01 to 1.81. On the other hand, the parameters for non-agricultural commodities range between 0.05 and 3.34 for both rural farm and non-farm households and between 0.15 and 3.73 for the urban households.

Concerning trade, the CES or Armington function value is the same as the CET function value for each commodity. The CET function for both exported and domestically sold commodities are identical to the CES function, the difference is the negative elasticities of substitution. The parameters range between 0.5 and 5.05 for the agricultural commodities and between 0.5 and 3.65 for non-agricultural commodities.

5.4. The Tanzanian Social Accounting Matrix

The model is calibrated to a 2016 social accounting matrix (SAM) for Tanzania which is an aggregation of the 204-account IFPRI Nexus Project SAM for Tanzania for the year 2016. The original 204-account SAM, which was developed by Randriamamonjy and Thurlow (2017) from IFPRI under the Nexus Project, had a total of 82 activity and 83 commodity accounts as well as 15 household accounts. With such a high level of disaggregation, imbalances are inevitable and thus like other Nexus SAMs, cross-entropy techniques were used to reconcile the imbalances (Randriamamonjy and Thurlow, 2017).

For the purpose of this study, some of the SAM activity and commodity accounts were aggregated to ease the analysis. The final SAM used for this study has 41 activities with an equal number of commodities. The aggregated SAM consists of 19 agricultural, 18 industrial and 4 services accounts. Of the industrial accounts, agro-processing constitutes 15 accounts; 10 accounts for the food industry and 5 accounts for the non-food industry. The SAM account names are presented in Table A1 in the appendix.

There are 13 factor accounts: eight labour accounts (grouped according to education level and location – rural or urban), four capital accounts and one land account. Regarding institutions, there is one enterprise account, a core government account and 15 household accounts. Households are divided into rural and urban (hhd-u) households. The rural households are further disaggregated by their primary activities, into the farm (hhd-f) and non-farm (hhd-n) households. All the households are further grouped into five per capita income quintiles. There are five tax collection accounts - one for each tax type (direct, export, factor, import and sales taxes) - that are separated from the core government account. The SAM also have savings and investment, changes in stocks and foreign trade and transfer accounts.

The model recognises three types of transaction cost accounts; namely, domestic, export and import transaction cost. However, in the original 2016 SAM, transaction costs were aggregated into one account. This account was, however, split into the three different transaction accounts (domestic, export and import) for each activity based on the shares of domestic production, imports and exports in each activity. The (dis)aggregation of the original SAM was done manually and since the SAM was already balanced, no imbalances occurred.

Characteristics of the economy in the 2016 SAM

Table 5.1 presents the structure of the Tanzanian economy as portrayed in the SAM in 2016. The services sector has the highest share in GDP, value-added and total production (output) gross of taxes. Agriculture has the lowest share in total output despite a high share in GDP. However, its share in exports is significantly high, mainly dominated by the export of crops. Imports of agricultural produce are, on the other hand, very low. The industrial sector, particularly manufacturing and mining, has the highest shares in trade. Imports of manufacturing are more than three-quarters of the total imports, mainly dominated other manufacturing products and a significant share of agro-processed imports. Agro-processed exports, however, make the largest share of manufacturing exports.

Table 5.1: Structural Characteristics of the Tanzanian economy (% share) in the base year (2016)

	GDP	Value-added	Output	Imports	Exports
Agriculture	29.15	27.00	18.81	2.19	17.18
Crops	15.98	15.98	11.84	2.08	17.03
Livestock	7.12	6.40	4.01	0.04	0.08
Forestry	4.04	2.92	1.64	0.07	0.02
Fisheries	2.01	1.70	1.32	0.00	0.05
Industry	27.42	29.40	35.66	76.91	46.69
Mining	3.70	2.86	3.76	0.52	29.04
Manufacturing	5.56	8.37	12.46	76.17	17.65
Agro-Processing	3.76	4.48	7.90	11.09	10.35
Food processing	*2.86*	*3.50*	*6.45*	*6.33*	*6.77*
Non-Food processing	*0.90*	*0.98*	*1.45*	*4.76*	*3.58*
Other Manufacturing	1.79	3.89	4.56	65.08	7.30
Other Industries	18.17	18.17	19.44	0.22	0.00
Services	43.43	43.60	45.52	20.91	36.12
Trade and transport	17.56	16.37	17.09	9.36	11.07
Hospitality	1.11	1.11	4.19	8.27	20.72
Other Services	24.76	26.12	24.24	3.28	4.33
Total	100.00	100.00	100.00	100.00	100.00

Source: Tanzania SAM

Table 5.2 presents the structure of the agro-processing industries. Agro-processing activities made up 3.76 percent of the total GDP. The food and non-food industries accounted for 2.86 and 0.90 percent in total GDP, respectively. Grain milling, sugar and edible oils are the largest industries.

Table 5.2. Structural Characteristics of the Agro-processing sector (%) in the 2016 SAM

	Share in total GDP	Share in Agro-processing GDP	Imports		Exports	
			Share in Imports	Import intensity**	Share in Exports	Export intensity*
Food industries						
Meat	0.09	2.5	0.08	3.06	0.12	3.63
Fish and seafood	0.04	1.13	0.21	22.81	2.46	73.1
Dairy	0.04	1.09	0.1	18.54		
Vegetables	0.04	1.19	0.07	40.24	0.84	82.7
Oils	0.38	10.13	3.25	39.01	2.5	26.03
Grain milling	0.64	17.13	0.15	0.89	0.17	0.5
Sugar	0.53	14.07	1.33	30.1		
Tea and coffee	0.06	1.65				
Other foods	0.38	10.14	0.65	8.03	0.49	4.11
Beverages	0.64	17.1	0.48	13.92	0.19	0.36
Non-food industries						
Tobacco	0.11	2.83	0.03	4.65	0.14	2.37
Textiles	0.28	7.36	1.24	32.87	1.68	28.29
Clothing	0.17	4.57	1.16	34.58	0.83	9.61
Leather	0.02	0.47	0.59	50.19	0.05	3.19
Paper and wood	0.33	8.67	1.74	34.65	0.88	6.88
Total	3.76	100	11.09	19.16	10.35	10.59

Source: Tanzania SAM

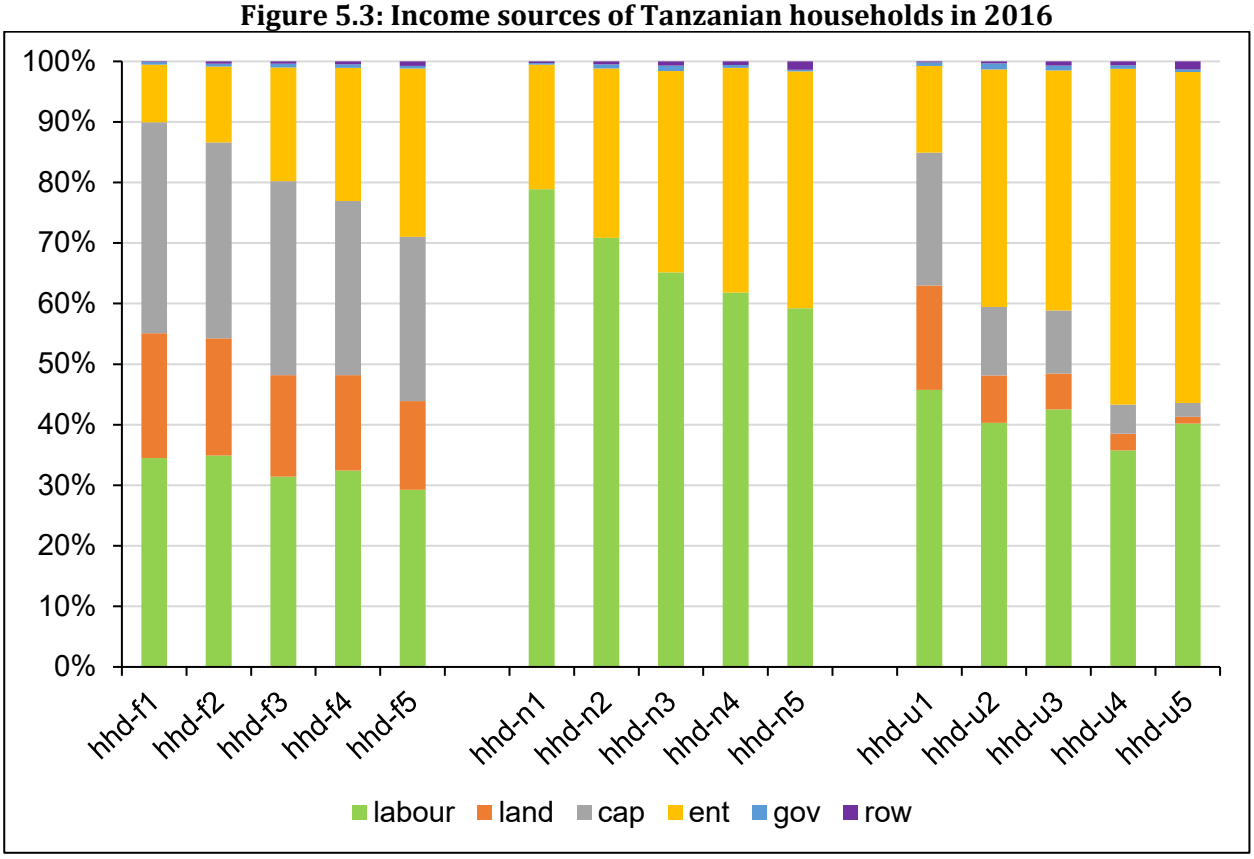
* Export intensity is the share of exported goods and services to total domestic output.

** Import intensity is the share of imported goods and services relative to domestic consumption.

The agro-processing sector also accounted for 10.35 percent of exports while their share in imports was even higher. Industries such as dairy, sugar and tea and coffee recorded no exports in 2016. Some industries, for example, the vegetable industry, are both export and import intensive.

Figure 5.3 presents the sources of income for households in 2016. The total amount of incomes was TZS82,427 billion. The rural farm households received a total of TZS35,544 billion while the non-farm households and the urbanites received TZS2,900 billion and TZS43,982 billion, respectively. The rural household income sources are more diversified, as well as the lower quintile urban households. The non-farm households, on the other hand, have less diversified sources. They derive their incomes predominantly from labour and from enterprises with no rents from capital or land. The transfers from government and the rest of the world constitute a very small percentage of all the households' incomes. On aggregate, the highest source of incomes for the households is from enterprises, 70 percent of which is claimed by the urban households in the top two income quintiles. The amount derived from enterprises increases with the income quintile level in both rural and urban households.

Figure 5.3: Income sources of Tanzanian households in 2016



Source: 2016 Tanzanian SAM

Note: the number in front of household name denotes the quintile, e.g., hhd-f1 = rural farm household, income quintile 1, with quintile 1 being the lowest income group

A closer inspection of the SAM (not presented in Figure 5.3) shows that the majority of the labour incomes in rural farm households are from primary educated labour followed by that from uneducated labour and then secondary educated. Tertiary educated labour makes a little contribution to only the top two income quintiles. Uneducated labour incomes make the least share of labour incomes of the non-farm and urban households' labour incomes with the highest share received from primary educated labour incomes, followed by secondary and then tertiary-educated labour. Both rural and urban households also receive incomes from capital (crops and livestock) as well as land.

5.5. Application of the model: Simulations

The model is run for a period of nine years (2017 – 2025). Below is an outline of the simulations considered in the study. The summary of the five policy simulations are presented in Table 5.3.

Baseline scenario

A baseline scenario is first established in the model for the period 2017-2025. The alternative scenarios are benchmarked against this scenario. The base year is 2016 and exogenous trends are imposed on the model to replicate the current growth in the economy. The total population and labour force are set to grow at 3 percent annually, which is the recently observed trends (URT, 2018b; WDI, 2018). Land, however, grows at 0.5 percent per annum (Dorosh and Thurlow, 2014) which is lower than the observed

trends. Total factor productivity growth is imposed to target the observed growth rate in total GDP but is also varied among broad sectors to closely resemble the observed growth rate in these sectors. TFP growth rate is set at 0.6 percent per annum for the service sector while it is at a low of -0.6 percent per annum for primary agriculture. The TFP growth rate imposed for the agricultural sector was the actual observed growth rate between 2001 and 2010 (IFPRI, 2018). In the industrial sector TFP grows slowly at 0.2 percent per annum for the agro-processing activities while it is higher for all the other industrial sector activities (0.8 percent). The changes in factor supplies and TFP lead to annual average total GDP growth of 6.39 percent.

Simulation 1 (TFP): Productivity increase in agro-processing

The Tanzanian manufacturing industry suffers from low productivity levels. In this scenario, total factor productivity (TFP) growth is accelerated for agro-processing activities, which is assumed to be driven by the increase in FDI inflows. The Tanzanian government aims to increase FDI inflows and thus has put in place several incentives to attract FDI (TIC, 2018). The incentives in the SEZ are vital in attracting FDIs. Chuang and Lin (1999) found an increase in the investment ratio of FDIs to produce 1.40 percent to 1.88 percent gain in domestic firms' productivity. Based on their findings, Kinyondo and Mabugu (2009) applied a 1 percent increase in productivity to evaluate the impact of FDIs on South African industries. In this simulation, the productivity growth rate of agro-processing firms is increased by 1 percentage point from the baseline level leading to annual TFP growth of 1.2 percent. This additional growth rate is assumed to be accounted for by a once-off 5 percent increase in foreign savings (FSAV).

In the CGE model, changes in productivity are captured by the efficiency parameter (α_a^{va}) in the CES production function at the bottom level production nest, that is, in the aggregation of primary factors, value-added (QVA). Equation 5.1 below shows the CES function.

$$QVA_a = \alpha_a^{va} \cdot \left(\sum_{f \in F} \delta_{f\,a}^{va} \cdot {QF_{f\,a}}^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}} \qquad 5.1$$

where α_a^{va} is the efficiency parameter in the CES value-added function, $\delta_{f\,a}^{va}$ is CES value-added function share parameter for factor f in activity a, QF_{fa} is the quantity demanded of factor f from activity a while ρ_a^{va} is the CES value-added function exponent.

Simulation 2 (PWE): Access to foreign markets

As highlighted earlier, there is a growing external demand for agro-processed products. The Tanzania Development Vision highlights the need for a competitive economy that responds to the need of the regional and global markets. In addition, the Integrated Industrial Development Strategy which accords priority to agro-processing development highlights the importance of export-led industrialisation (URT, 2016a). The EPZ program's focus is also on boosting exports. The PWE scenario examines the impacts of an outward-oriented policy in which the government focusses on market access of agro-processed products to foreign markets. The effect of the strategy is to increase the volume of exports.

In the model, the quantity of exports (QE) is endogenous and can thus not be shocked. However, an increase in the quantity of exports in the model can be derived by changes in the export price. This is the price, in the local currency, that the domestic producers receive when they sell their commodities to the rest of the world. The price is expressed as the export price (pwe_c) in foreign currency multiplied by an export tariff adjustment factor ($1 + tm_c$) and the exchange rate (EXR), minus any trade input costs incurred to make the sale. The equation 5.2 below shows the calculation of the export price, where $ice_{c'c}$ is the quantity of commodity c' as traded input per exported unit of c.

$$PE_c = pwe_c.(1 - te_c).EXR + \sum_{c' \in CT} PQ_{c'}.ice_{c'c} \quad 5.2$$

The simulation was implemented through a 10 percent once-off increase in the base year world price (pwe_c) of all agro-processing commodities.

Simulation 3 (TFPwe): Increasing both productivity and foreign market access

This scenario is a combination of simulation 1 and 2. As highlighted by Diao (2010) productivity-driven expansion of the agro-industry may be limited due to limited growth in incomes in the local market, if the primary agricultural sector, from which the majority of the consumers derive incomes from, does not expand first. Export markets can, however, overcome the limited growth in local demand. This simulation explores the simultaneous effects of productivity growth in agro-processing and export-push strategies.

Simulation 4 (EDUC): Increased secondary and tertiary educated labour

Educated and skilled labour is very low in Tanzania (Morisset and Haji, 2014) and is part of the limiting factors of industrial growth. This scenario is aimed at examining the impacts of increasing the quantity of educated labour in the Tanzanian economy as part of the industrial policy (URT, 2016a). The government devoting a relatively large share of the budget to education to ensure availability of educated labour with the right skills for industrial growth. This policy is not sector-specific and is implemented in the whole economy. In this scenario, the growth rate of secondary and tertiary educated is increased from the baseline value to 4 percent. Thus, both rural and urban secondary and tertiary educated labour's growth rates (LFGR in the model) is increased by an additional 1 percentage point from the baseline level.

To account for the increase in educated labour, government consumption on education was increased by 10 percent. In the model equations, this is introduced as a shock to the exogenous (unscaled) government demand (qbar(C)) for the education commodity. Education and training to increase knowledge and skills will result in more efficient workers which in turn result in better quality products and services (Jajri., 2007). Thus, increasing education can improve productivity. However, the simulation does not consider the effects of educated labour on productivity. The strategy will benefit activities that use more educated labour.

Simulation 5 (AGTFP): Increasing primary agricultural output

As cited earlier, the possibility of agro-industry expansion depends on the performance of the primary industry and the availability of enough raw materials of this sector. So, it would thus seem more appropriate to first ensure that the primary industry expands first and then drive industrialisation. This simulation explores the impacts of an agricultural-led industrialisation strategy. The strategy is in line with Tanzania's Kilimo Kwanza ("agriculture first") vision (URT, 2016b). The shock is introduced by adding a percentage point to the baseline agricultural productivity growth. Thus, agriculture's total factor productivity grows at 0.4 percent per annum under the AGTFP simulation.

Table 5.3: Policy simulations

	TFP	**PWE**	**TFPwe**	**EDUC**	**AGTFP**
Total factor productivity (α_a^{va}) of:					
All agro-processing activities	+1	--	+1	--	--
All agricultural activities	--	--	--	--	+1
Foreign savings (*FSAV*)	+5%	--	+5%	--	--
World price (*PWE*) of:					
All agro-processing commodities	--	+10%	+10%	--	--
Labour force growth rate *(LFGR*):					
Secondary and tertiary educated labour	--	--	--	+1	--
Exogenous government demand *(qbar*) for:					
Education	--	--	--	+5%	--

5.6. Conclusion

The chapter highlighted the methodology implemented in the evaluation of ex-ante effects of the policies that are implemented to support the expansion of the agro-processing sector in Tanzania. The study uses a recursive dynamic CGE model which is calibrated to a 2016 SAM for Tanzania. The model allows for analysis of impacts over the long term and is run for a period of nine years. Five simulations will be explored to examine the impacts of the policies aimed at expanding the agro-processing activities.

Chapter 6: Results

6.1. Introduction

The study aims to understand the role that agro-processing development can play in the Tanzanian economy. The previous chapter highlighted the alternative policy strategies to expand the sector that will be evaluated using the dynamic model, run for nine years. This chapter presents the model results and a discussion of these results. The second section briefly discusses the baseline outcomes with a focus on domestic production, GDP, exports and imports. The subsequent sections are discussions on the changes that will be caused by the simulated policy strategies to the baseline outcomes. Section 3 discusses the changes to GDP growth and economic structure. The fourth section presents the effects of the strategies on domestic production. The fifth section discusses the trade impacts within the agro-processing sector and the whole economy. The sixth and seventh sections discuss the impacts of policies on factor and household incomes while the eighth section presents the welfare impacts. This is followed by a sensitivity analysis in section 9 and then a conclusion on the chapter findings.

6.2. The baseline scenario

The baseline is the estimated changes in the Tanzanian economy from the base year 2016 to 2025, in the absence of any policy scenarios. It takes into account assumptions about productivity, factor supplies, population growth etc. The combination of the exogenously imposed growth of total factor productivity and changes in labour and land supplies and the endogenous capital accumulation results in the total GDP growing at a rate of 6.39 percent per annum from 2016 to 2025 in the baseline. Measured in real terms, the economy's GDP expands from TZS 94,850 billion in 2016 to TZS 165,606 billion in 2025. Figure A1 in the appendix presents the trends in total GDP and agriculture, industry and service sectors' GDP between 2016 and 2025. The GDP of the industrial subsectors is also presented in that illustration, mainly to show the changes to the agro-processing sector. At sector level, GDP of agriculture grows slower than other sectors at an average of 5.04 percent annually while that of industry and services grow at 7.08 and 6.79 percent per annum, respectively. The subsectors within these broad categories, however, grow at different rates (Table 6.1) and so do the different activities within the subsectors. The differences in sectoral growth rates result in changes in each sector's share in GDP (Table 6.2). Figure A2 in the appendix traces the yearly changes in the structure of GDP.

The changes in domestic production (QX) observed between 2016 and 2025 under the baseline assumptions are presented in Figure A3 in the appendix. All the activities record increases in output. The majority of the crops generally record modest changes in output compared to other activities. Livestock production has the highest increases in production among agricultural activities. The mining sector has the highest increase in output compared to all other activities. Among the agro-processing

activities, the grain milling and feed industry record the lowest changes in output probably reflecting the limited production of crops.

The total exports grow at annual average rate of 7.98 percent while total import growth is slightly lower at 7.12 percent per annum (Table 6.3). The industry records the highest growth in both exports and imports. Mining has the highest export growth. Export growth for agro-processed products averages 9.06 percent per annum while the products' import growth is about 5.77 per annum. The changes in exports and imports are a combination of changes in production, demand and the exchange rate. The exchange rate depreciates by 2.69 percent and thus favours growth in exports. Table A2 in the appendix illustrates the export-output and import demand relationships. With the increased production, the share of exports to total production increases in almost all the sectors except for crops, forestry and other services probably due to modest output increases in these sectors. The share of imports in total demand, on the other hand, is seen to increase in some sectors (other manufacturing, mining) despite the increase in local production.

By 2025, the share of industrial exports will increase by 8.06 percentage points from their initial share of 46.69 percent in 2016, mainly driven by mining exports. Agricultural-related manufacturing export shares will slightly increase. Conversely, the shares of primary agriculture and services exports will decrease by 4.54 and 3.51 percentage points, respectively. Industry continues to account for the majority share in imports which increases to 78.53 percent by 2025 from the initial share of 76.91 percent. This increase is mainly driven by imports of capital (other manufacturing) goods. The other industrial sectors' share in imports declines especially that of agro-related manufacturing. The share of agriculture and service imports also decreases in the baseline projections (Table 6.4).

6.3. Impact of policies on GDP growth and economic structure

The results of the policy simulations show that the policy strategies have different outcomes on sectoral and total GDP growth (Table 6.1) which results in changes to the economic structure (Table 6.2).

TFP

Increasing the productivity of the agro-processing industries increases the agro-processing sector's average annual GDP growth rate from 6.91 in the baseline to 7.65 percent. Within the agro-processing sector, growth in the food processing was 0.73 percentage points higher than in the baseline. The non-food processing sector gained additional 0.78 percentage points in growth compared to the baseline. The growth of agro-processing activities generates linkages with other sectors, spurring growth in these sectors. Additional growth in agriculture, other manufacturing and services sectors is recorded due to the expansion of the processing sector. Within the agricultural sector, however, growth in the GDP of crops, in general, remains unchanged. There are however differences at crop subsector levels (not in the table). Crops such as maize, wheat, pulses, tobacco and coffee show some decrease in growth while the

expansion of the processing sector has a pull effect on the growth of the other crops such as maize, rice and wheat, among others.

The additional growth in agro-processing results in an additional 0.06 percentage points in total GDP growth as compared to the baseline. Generally, the productivity increase does not result in higher growths. This probably reflects the conclusions of Breisinger et al. (2009) and Diao (2010) that significant growth is constrained by the overdependence of the processing sectors on raw materials from primary activities and on the local market (incomes), whose growths are limited if agricultural growth is slow.

PWE

A strategy that solely focuses on diversifying foreign markets for agro-processed products does not significantly affect the overall growth of the sector and the total economy. This low growth emanates from the fact that while exports of agro-processed products expand, imports also rise at the same time to fulfill the local market demand. The results (third column in table 6.1) show that the expansion of export markets leads to an increase in growth of the agro-processing sector by 0.64 percentage points from the baseline. This export-driven expansion in the sector only adds 0.01 percentage points to the overall economic growth in the baseline, which is lower compared to the productivity scenario. Within the agro-industry, the non-food processing sector in overall tends to benefit from increased access to foreign markets as growth in this sector is 1.17 percentage points higher than the baseline level. This growth is even higher than that recorded under the productivity scenario. The leather sector, however, records lower growth than in the baseline. The food sector growth rate, on the other hand, is less pronounced and lower than that recorded under productivity simulation. Closer inspection, however, shows that within the sector, the fish and seafood, vegetable, and oil processing industries expand significantly but the non-export-oriented industries, such as dairy and sugar refinery, has lower growth thus reducing the overall growth of the food sector.

The limited upstream expansion, particularly in the food industry, reflects on the growth of the primary agricultural activities. While forestry, fisheries and livestock sectors record positive growth, the crop subsector's growth decreases by 0.09 percentage points from the baseline level. The net effect is a stagnation in agricultural sector growth. In the industrial sectors, growth in mining also slow down while other sectors remain almost unchanged and the total effect is a slight decrease of the total industrial growth by a 0.01 percentage point compared to the baseline. Overall growth in the service sector increases by the same percentage points as in the TFP scenario but changes are observed among the subsectors. Growth was reduced in hotels and restaurants while the trade and transport industries gained.

TFPwe

The simultaneous effects of productivity increase and expansion of foreign markets (fourth column, table 6.1) were the rapid growth in the agro-manufacturing sector. The sector expanded at an average growth rate of 8.32 percent per year which is higher than in either the TFP or the PWE scenarios. This growth also increased the expansion of other manufacturing and industrial sectors. The overall growth of the industrial sector was, however, retarded as growth in mining slowed down by 0.85 percentage points as compared to the baseline growth. The primary agricultural sector, on the other hand, expanded at the same growth rate as in the TFP scenario. Growth was higher in the forestry, livestock and fisheries subsectors but the crop subsector's growth was lower to the same rate as under the PWE scenario. The service sector, on the other hand, expanded at an average growth rate of 6.89 percent which was 0.1 percentage points above the baseline growth rate. Finally, total GDP growth increased by 0.08 percentage points from the baseline level.

EDUC

As depicted in the education scenario, labour-driven growth plays a large role in developing economies. Growth in GDP is 0.24 percentage points higher than in the baseline, which is higher than in the productivity scenario. Increasing the quantity of educated labour has a significant impact on the growth of all the broad sectors in the economy. Agricultural average growth rate under the education scenario is 0.14 percentage points higher than the baseline growth. The industry, on the other hand, grew at 7.25 percent which is 0.17 percentage points higher than the baseline level. The service sector benefited more from the increase in education as growth increased by 0.28 percentage points from the baseline growth rate. Within the industry, mining and other manufacturing industries are the major drivers of the growth. The agro-processing sector did not result in higher growth because the educated labour is not specifically targeted to agro-processing, the sector has to compete with the rest of the sectors in hiring the additional labour. Comparing to the TFP scenario, the agro-processing sector recorded lower growth in their GDP.

AGTFP

The expansion of primary agriculture will remain a key element in the growth of the Tanzanian economy. Productivity increases in the primary sector resulted in the highest growth of the economy as compared to the other scenarios (sixth column table 6.1). The expansion of primary agriculture was also the highest under this scenario. The sector grew by an additional 0.95 percentage points compared to the baseline growth. The crops and fisheries subsectors were more dynamic, with growth exceeding the baseline level by more than one percentage points. The role linkages of the agricultural sector were reflected in the growth in other sectors following the expansion of the sector from productivity increases. As expected, the expansion of agriculture positively impacted the agro-processing sector as more inputs were made available for the industry's expansion. The processing sector's average growth rate increased from 6.91 percent in the baseline to 7.04 percent which is the same growth as recorded

in the industry under the education scenario. However, it is only the food industry that benefited from the expansion in the input industry. The non-food industry growth slowed down by 0.03 percentage points compared to the baseline level while the food industry growth rate increased by 0.18 percentage points. The other manufacturing and industry sectors slightly increased their growth. However, the additional slowdown in the mining sector weighed down the total industry growth. The service sector, on the contrary, expanded by 0.18 percentage points from the baseline level. This growth was even higher than that recorded under the first three policy simulations directly targeting the agro-processing sectors indicating the stronger linkages that are generated between agriculture and the service sector. The impact of agricultural expansion on the growth of other sectors was thus more significant in the service sector and less pronounced in the industrial sector.

Table 6.1: Average annual growth rates of real GDP at factor cost (2017-2025)

	BASE	TFP	PWE	TFPwe	EDUC	AGTFP
Agriculture	5.04	5.07	5.04	5.07	5.18	5.99
Crops	3.87	3.87	3.78	3.78	4.00	4.92
Livestock	7.08	7.14	7.10	7.16	7.25	8.05
Forestry	4.91	4.96	5.01	5.07	5.07	5.35
Fisheries	6.34	6.39	6.68	6.73	6.41	7.45
Industry	7.08	7.19	7.07	7.18	7.25	7.04
Mining	10.12	9.98	9.44	9.27	10.30	9.65
Agro-processing	6.91	7.65	7.55	8.32	7.04	7.04
Food	*6.75*	*7.48*	*7.21*	*7.96*	*6.85*	*6.93*
Non-food	*7.40*	*8.18*	*8.57*	*9.40*	*7.60*	*7.37*
Other manufacturing	8.73	8.76	8.77	8.79	8.92	8.76
Other industries	6.23	6.26	6.24	6.27	6.39	6.26
Services	6.79	6.84	6.84	6.89	7.15	6.97
Trade and transport	7.25	7.31	7.37	7.44	7.41	7.42
Hotels and restaurants	7.39	7.39	7.11	7.09	7.54	7.60
Other services	6.43	6.48	6.43	6.48	6.95	6.61
Total GDP	6.39	6.45	6.40	6.47	6.63	6.71

Source: Tanzania model results

Structural changes

No significant deviations from the baseline shares of the three broad sectors were recorded under the simulations except in the agricultural expansion (AGTFP) scenario (Table 6.2). In the first four simulations, change in agriculture's share ranged from -0.17 to -0.04 percentage points, that of the industry's between -0.05 and +0.11 and that of services ranged between -0.03 and +0.08 percentage points. Nevertheless, under the agriculture-led growth scenario, the share of agriculture increased by 1.43 percentage points from the base value while the industry's and service's share both decreased by 0.87 and 0.56 percentage points respectively.

Table 6.2: Sector share of total real GDP by 2025 (%)

	2016	2025					
	INITIAL	**BASE**	**TFP**	**PWE**	**TFPwe**	**EDUC**	**AGTFP**
Agric	29.15	25.99	25.92	25.95	25.88	25.91	27.42
Crops	15.98	12.88	12.82	12.76	12.70	12.81	13.72
Livestock	7.12	7.54	7.54	7.55	7.54	7.54	7.96
Forestry	4.04	3.56	3.56	3.59	3.58	3.56	3.60
Fisheries	2.01	2.00	2.00	2.06	2.05	2.00	2.14
Industry	27.42	29.07	29.18	29.01	29.12	29.18	28.20
Mining	3.70	5.04	4.96	4.76	4.67	4.94	4.72
Agro-processing	3.76	3.93	4.16	4.14	4.39	4.18	3.87
Food	*2.86*	*2.95*	*3.12*	*3.06*	*3.25*	*3.13*	*2.92*
Non-food	*0.90*	*0.98*	*1.04*	*1.08*	*1.15*	*1.05*	*0.95*
Other manufacturing	1.79	2.18	2.18	2.19	2.18	2.18	2.13
Other industries	18.17	17.92	17.88	17.92	17.87	17.88	17.48
Services	43.43	44.94	44.90	45.04	45.00	44.91	44.38
Trade and transport	17.56	18.87	18.88	19.04	19.05	18.90	18.64
Hotels and restaurants	1.11	1.20	1.20	1.17	1.17	1.20	1.19
Other services	24.76	24.86	24.82	24.83	24.78	24.82	24.54
Total GDP	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Sources: Tanzania model CGE results

6.4. Impact of policies on sectoral production (QX)

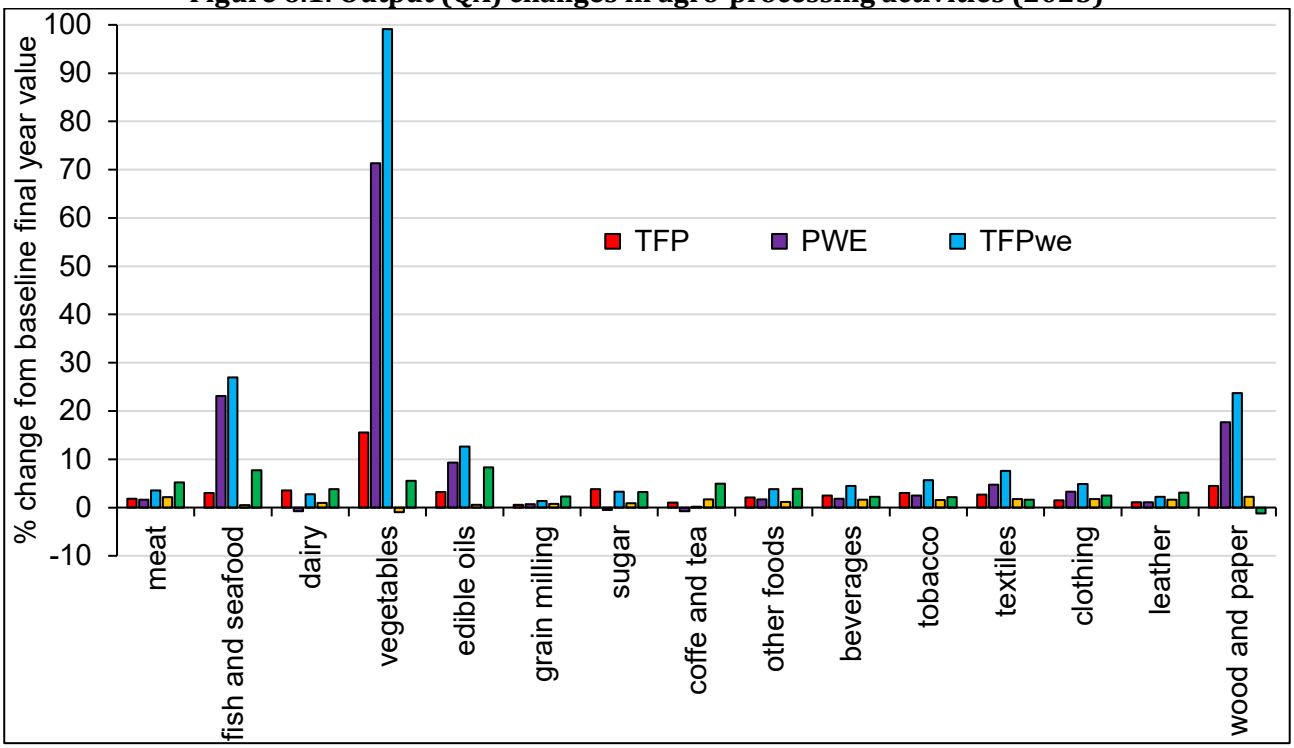
The policy simulations show different outcomes on sectoral production. Figure 6.1 and 6.2 show the changes to output for agro-processing activities and all other activities, respectively. The changes are percentage deviations of output under each simulation in 2025 compared to the quantity of output in the baseline in 2025.

The productivity strategy (TFP) and the combined strategy (TFPwe) have a positive impact on output of all agro-processing activities. Vegetable processing industry's production records the largest increases under both strategies. The export strategy (PWE) on the hand negatively affects the production of sugar, coffee and tea and dairy. These activities are non-exporting industries. For the other activities production increases are observed in the majority of the activities under the three strategies (TFP, PWE and TFPwe) except for a few exporting activities such as mining, other manufacturing, wheat, pulses, coffee and tea and tobacco as well as in hotels and restaurants under the PWE and TFPwe strategies. The appreciation of the exchange rate, compared to the baseline, these strategies indirectly affected these activities. These activities' production is also negatively affected by the export push strategy (PWE) due to indirect effects of exchange rate that make their exports less competitive.

The education strategy (EDUC) improves output production in almost all the activities except vegetable processing. Basically, production increases are more in activities that employ a higher share of educated labour. Most of the agro-processing activities thus record low increases in production due to less

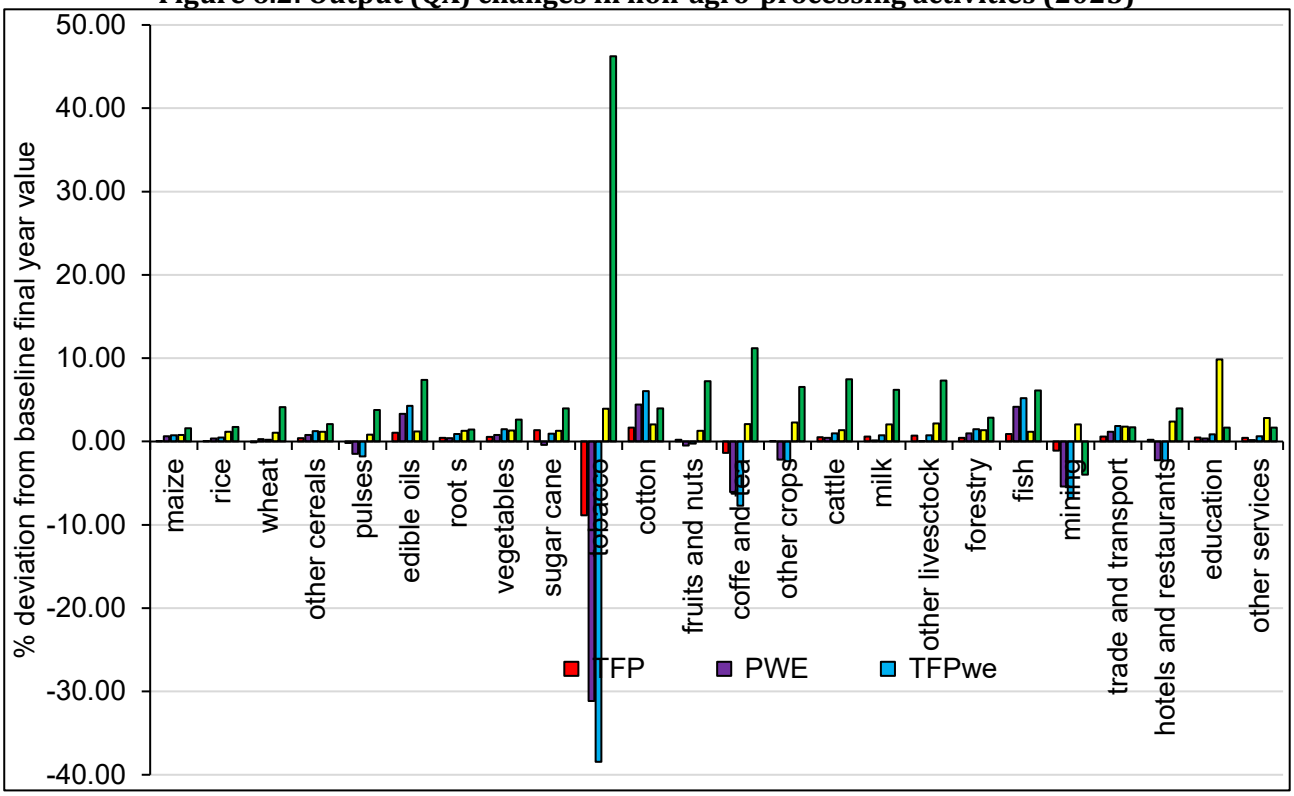
educated labour being employed in the activities. Except for mining, the wood and paper, and other manufacturing industries, all the other activities' production increases under the agricultural expansion (AGTFP) strategy.

Figure 6.1: Output (QX) changes in agro-processing activities (2025)



Source: Tanzania model results

Figure 6.2: Output (QX) changes in non-agro-processing activities (2025)



Source: Tanzania model results

6.5. Impact of policies on trade

Table 6.3 presents the growth in trade under different scenarios. The relationship between trade and output or domestic demand is shown in Table A2 in appendix.

Table 6.3: Average annual growth rate of real exports and imports (2017 -2025)

	BASE	TFP	PWE	TFPwe	EDUC	AGTFP
Exports						
Agriculture	4.36	3.99	2.87	2.47	4.59	6.89
Crops	4.32	3.95	2.83	2.42	4.56	6.85
Livestock	8.45	8.24	7.18	6.85	8.42	11.85
Forestry	5.14	4.92	4.18	3.86	5.51	8.80
Fisheries	7.59	7.61	7.87	7.83	7.65	8.96
Industry	9.90	9.95	10.35	10.44	10.12	9.54
Mining	10.35	10.19	9.56	9.34	10.61	9.76
Agro-processing	9.06	9.84	13.43	14.21	9.15	9.35
Food	*8.05*	*8.82*	*12.15*	*12.93*	*8.03*	*8.93*
Non-food	*10.79*	*11.60*	*15.62*	*16.41*	*11.06*	*10.12*
Other manufacturing	9.23	9.14	8.85	8.73	9.45	8.94
Services	6.76	6.77	6.50	6.48	7.06	7.04
Trade and transport	7.49	7.51	7.46	7.48	7.70	7.52
Hotels and restaurants	6.42	6.42	5.99	5.95	6.73	6.91
Other services	6.43	6.44	6.30	6.29	6.94	6.43
Total exports	7.98	7.96	7.95	7.94	8.22	8.24
Imports						
Agriculture	5.72	5.74	5.88	5.95	5.89	5.84
Crops	5.63	5.64	5.73	5.77	5.80	5.88
Livestock	9.98	10.42	11.51	12.16	10.55	8.10
Forestry	5.18	5.44	6.15	6.53	5.17	2.57
Fisheries	5.50	5.67	6.11	6.34	5.71	5.59
Industry	7.36	7.40	7.49	7.54	7.60	7.58
Mining	5.59	5.79	6.31	6.55	5.82	6.25
Agro-processing	5.77	5.62	6.11	6.00	6.00	6.10
Food	*5.55*	*5.39*	*5.93*	*5.81*	*5.80*	*5.89*
Non-food	*6.06*	*5.93*	*6.35*	*6.25*	*6.27*	*6.37*
Other manufacturing	7.64	7.71	7.73	7.81	7.89	7.84
Other industries	2.44	2.66	3.24	3.59	2.50	3.29
Services	6.31	6.42	6.57	6.71	6.48	6.69
Trade and transport	6.30	6.42	6.62	6.78	6.50	6.70
Hotels and restaurants	6.06	6.16	6.30	6.42	6.23	6.43
Other services	6.92	7.02	7.10	7.22	7.07	7.32
Total imports	7.12	7.17	7.27	7.34	7.34	7.36

Source: Tanzania CGE model results
**real values, exchange rate (EXR0) = 1

TFP

Consistent with the literature, the additional growth in productivity of the agro-processing activities makes Tanzanian processed agricultural products more competitive on the global market, expanding the agricultural-related manufacturing exports. This is revealed in the model results (Table 6.3) which

show an increase in the average annual growth rate of the sector's exports from 9.06 percent in the baseline to 9.84 percent, that is, additional growth of 0.78 percent. At a broader level, the non-food processing industry with a higher additional GDP growth rate, in turn, had higher growth in exports, a 0.81 percentage points increase compared to the baseline value. The food industry's export growth, on the other hand, increased by 0.76 percentage points from the baseline growth.

Expansion of agriculture-related manufacturing exports also increases, slightly, the growth in exports of services. However, growth in other industrial and agricultural exports decreases. This decrease in growth of other sectors' exports has a negative effect on total exports which is consistent with the findings of the static model results of Fukase and Martin (2017). Raw agricultural exports decline significantly because of productivity-driven growth in the downstream sectors which increases demand for intermediates in the processing sector, causing some agricultural products that were previously exported in raw form to be processed before exporting. However, exports of some products such as sugar, fish and cotton still increase (not shown in table) probably due to processing being still limited.

Expansion of agro-processing activities due to productivity gains not only increases exports but also the quantity of output available for the domestic market. Import substitution of agro-processed products takes place indicating the increase in competitiveness of agro-processing industries relative to foreign competitors. The average annual growth rate of imports in the sector falls from 5.77 percent in the baseline to 5.62 percent. The ratio of imported agro-processed products in domestic demand decreases from 19.26 in the baseline to 19.05 percent under this strategy. There is, however, a slight increase in raw agricultural imports from 5.72 percent in the baseline to 5.74 percent as well as an increase in imports of capital goods. This is due to the decrease in production of other manufacturing industries as well as some agricultural activities under this strategy.

PWE

Agro-manufacturing exports grew rapidly under the export export-oriented strategy. The average annual growth of food exports increased from the baseline level of 8.05 percent to 12.15 percent while that of the non-food products increased from 10.79 to 15.62 percent. This led to the total agro-processed exports growth rate to increase by 4.37 percentage points from the baseline level. Growth in the other industrial subsectors' exports, however, declined but the higher growth in agro-manufacturing exports resulted in an overall increase in industrial export growth. The attractiveness of the export markets led to the conversion of raw materials, which were once exported directly, into processed products, to take advantage of the foreign markets. Thus, the agricultural sector's export growth declined by 1.49 percentage points from the baseline level. The growth of service exports also recorded a decline.

The expansion of the processing sector through an export-oriented strategy, unlike in the productivity scenario, decreases the quantity of output available for the domestic market. This leaves the local

demand to be met through imports. Under this strategy, the growth of total agro-processed products increased by 0.34 percentage points from the baseline level. The major increase was in the growth of food imports which rose by 0.38 percentage points, from the baseline growth rate of 5.55 percent, while the non-food imports growth expanded by only 0.29 percentage points from the baseline level. Because the export strategy did not induce major expansion of the other sectors' output, the level of imports also increased in these sectors to support the industrialisation process. The growth of agricultural, other manufacturing, other industry and services imports rose by 0.16, 0.13, 0.80 and 0.26 percentage points from the baseline rates, respectively. Overall, growth in total imports increased by 0.15 percentage points from the baseline.

TFPwe

The highest expansion of processed agricultural products' exports was recorded in the combined strategy (TFPwe) where the export growth rate increased by 5.15 percentage points from the baseline. Growth in food exports increased by 4.88 percentage points from the baseline rate to 12.93 percent per annum while the non-food export growth increased by 5.62 percentage points from the baseline rate of 10.79 percent. The strategy also resulted in the largest decrease (-1.89 percentage points) in the growth of raw agricultural exports. Import substitution of agro-processed products did not, however, take place, indicating the dominance of the effect of the export market expansion strategy. Growth of agro-processed products imports increased by 0.33 percentage points from the baseline. Compared to the individual strategies, the combined strategy results in the largest decreases in exports of other sectors as well as the highest growth in imports.

EDUC

Increasing the quantity of educated labour, on the other hand, is effective in pushing total exports of all export products in the economy. Under the education scenario, total exports grew at an annual rate of 8.22 percent which was 0.26 percentage points higher than the baseline export growth. Growth in raw agricultural exports increased by 0.13 percentage points from the average annual growth rate in the baseline. A trade-off exists between the expansion of these primary exports and the exports of the processed products; growth in agro-processed exports is only 0.09 percent higher than the baseline growth which is lower compared to the effects of increased productivity. Exports of other sectors of the industrial sector, however, recorded higher growth rates. Educated labour also favoured the expansion of service exports. Imports also increased significantly due to the increase in educated labour. The total import growth rate increased from the baseline level of 7.12 to 7.34 percent. The industrial products recorded the highest additional growth (+0.24 percentage points) in imports compared to the baseline levels. Growth of imports of agriculture and services both increased by an additional 0.17 percentage points from the baseline.

AGTFP

Like in the first simulation (TFP), productivity increase in the primary agricultural sector enhances the competitiveness of the agricultural sector's commodities in the foreign markets leading to the rapid growth of raw agricultural exports (sixth column, Table 6.3). The average annual growth of the total agricultural exports increases by 2.90 percentage points from baseline value to 6.89 percent per annum. Within the sector, livestock and forestry exports are more dynamic. Growth of exports in these sub-sectors surpasses the total agriculture exports' growth. Crops and fisheries subsector's exports growth rates, on the other hand, increases from the baseline rates by 2.53, 3.40 and 1.37 percentage points, respectively. The share of agricultural exports to output increases by 12.03 percent (Table A2). A trade-off, however, is experienced between the expansion of these agricultural exports and the industrial exports. The growth of industrial total exports decreases by 0.36 percentage in comparison to the baseline growth. As shown above (Table 6.3), an agriculture-led expansion has a more significant impact in food manufacturing export growth than productivity increases within the manufacturing sector. The share of agro-processed products to production increases under this strategy.

Not only does productivity-driven growth of the primary agricultural activities stimulate the expansion of the country's exports but imports also increase despite the increased production under this strategy. The results show that the growth in total imports was the highest (+0.24 percentage points from the baseline) under the agricultural-led growth scenario (AGTFP). As in the TFP scenario, the expectation was that improvements in productivity in agriculture would expand the total domestic production resulting in import substitution of agricultural products. The simulation results, however, show an overall increase in agricultural imports growth from 5.72 percent per annum in the baseline to 5.84 percent. The results, however, show that import substitution would take place in the livestock and forestry sector products which recorded decreases in import growth of 1.88 and 2.61 percentage points from the baseline values, respectively. Agro-processing imports also saw an increase under this simulation, with the growth rate increasing from 5.77 percent to 6.10 percent. The share of agro-processing imports to domestic demand increases to 19.4 percent from the baseline share of 19.26 percent (Table A2). Overall, all industrial, as well as services imports, increased under this scenario. The strategy has positive income effects.

Changes in exports and imports within agro-processing

The changes in real exports and imports within the agro-processing subsectors are presented in Figures 6.3 and 6.4, respectively. The results are percentage deviations from final year baseline values.

TFP

Productivity increases have the highest impact on exports from meat as well as fruit and vegetable processing, which increases by 14.76 and 17.48 percent, respectively, from the baseline. The slow expansion encountered in grain-milling exports is probably a reflection of the negative impact on the

processing sector, of the slow growth in cereal grains. Grain-milling's inputs are mainly intermediates from primary agricultural activities, and thus significant growth in these activities might be a necessary pre-requisite for the downstream processing sector. The food sectors with higher increases in exports also have a significant reduction in imports. In the non-food industry, major increases in exports are recorded for wood and paper activities. While their exports slightly increase, imports of tobacco, clothing, and leather also increase relative to the baseline outcomes. These sectors have limited processing capacity and are among the sectors targeted for industrial expansion. The income effect of the productivity increases might have increased the effective demand for the products of these industries, which are less competitive than their foreign counterparts; hence the increase in their imports to meet the local demand.

PWE

As in the productivity scenario, the exports of meat as well as fruits and vegetables show dynamism under the foreign market access expansion strategy. Meat exports increase by 34.07 percent while fruit and vegetable exports are 82.08 percent higher than in the baseline. Export markets also have a significant positive impact on beverage exports which increases by 59.11 percent from the baseline values. In all the other food sectors, exports increase by more than 20 percent from the baseline levels. The market access strategy, however, does not substitute imports; it leaves unmet local demand to be satisfied through imports. Except for fruit and vegetables, the food sectors' imports increase by between 0.92 and 14.09 percent. In the non-food sector, as the wood and paper industry record the highest impact of market access with exports increasing by more than 90 percent compared to the baseline. The strategy also significantly increases exports from processed tobacco and clothing industries. Nevertheless, there is unmet local demand as evidenced by the increase in imports in all the non-food industries.

TFPwe

A combination of increases in productivity and foreign market access is extremely effective in boosting the exports of the agro-processing sectors, as compared to the two individual strategies' effects. Additional increases in exports from the food industries range from a minimum of 27.8 percent in the other food industries category to as high as 113.49 percent in the fruits and vegetables processing industry. Exports from fruit and vegetables, meat and beverage sectors also expand the most under the combined strategy. Likewise, in the non-food sector, the wood and paper industry exports also lead in the export expansion (+108.48 percent) while the least expansion in exports is experienced in the leather sector (+10.28 percent). Import substitution is, however, limited reflecting the dominance of the effect of foreign market access in this strategy. Only beverages and fruits and vegetable imports decrease in the food sector, while all the non-food industries' imports increase. Except for wood and paper imports, all the non-food imports increases are even more than in the foreign market access strategy.

EDUC

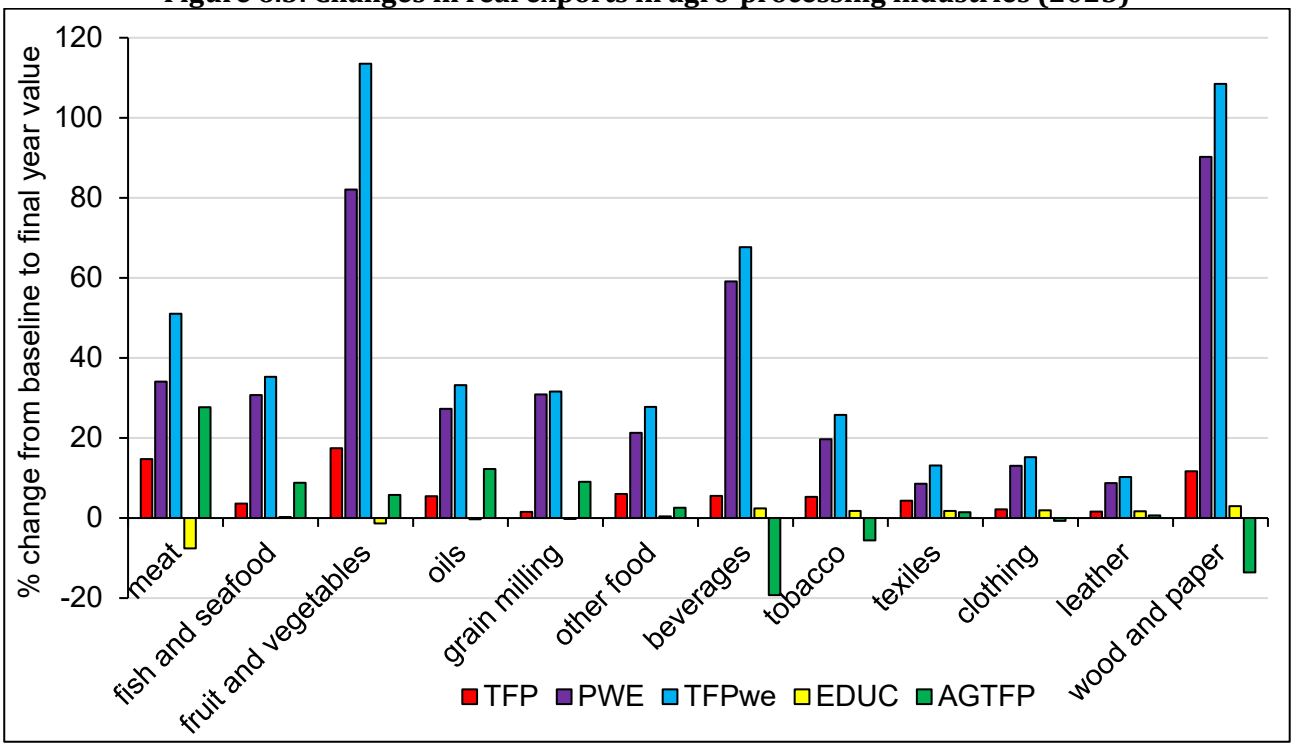
Unlike the productivity simulation, the education scenario yields mixed results on exports from the agro-processing industries. Except for fish and seafood and other food product exports, which increase slightly, exports from the food sectors decrease due to the increase of educated labour. All non-food agro-processed products increase, showing that the education scenario would benefit the relatively labour-intensive non-food processing sectors. However, imports increase for all agro-processed commodities. This is because of the high growth in other sectors of the economy, which require more inputs from the agro-processing sector, and the income effect, which causes increased demand for imports.

AGTFP

Though total food exports growth is greater under the agricultural-led growth strategy than in the TFP strategy (table 6.3), there are differences in export expansion across the various food industries. Meat, fish and seafood, oil, and grain-milling exports expand significantly, more than in the first strategy (TFP). These sectors seem to be much dependent on local inputs and they, therefore, thrive due to the availability of inputs emanating from the expansion of the local primary agricultural sector. While exports of other food and fruit and vegetable processing industries also expand, the expansion is less pronounced than when productivity is increased in the agro-processing sectors. Exports of beverages actually decrease by 19.22 percent due to agricultural expansion. This constrained export growth in these sectors is due to the trade-off with the primary agricultural exports. Growth in the primary activities allows for direct exports of raw materials and less is converted into processed products for the export market. In the non-food sector, additional export growth is only recorded in the textiles (1.49 percent) and leather (0.62 percent) industries. The rest of the industries' exports decrease with wood and paper recording the largest decreases in exports of 13.60 percent from the baseline.

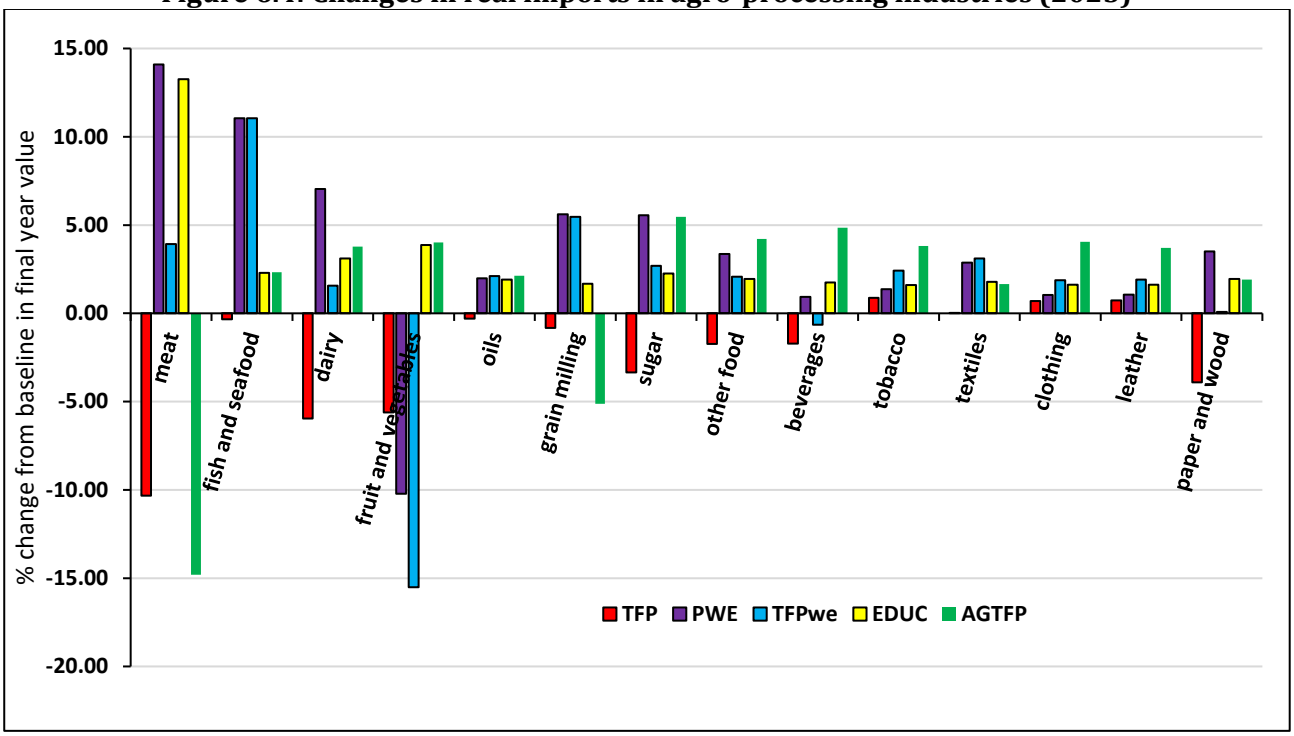
With regards to food imports, import substitution only takes place in the meat and grain-milling sectors where imports fall by 14.81 and 5.13 percent, respectively, compared to the baseline. Imports in the rest of the food industries record increases of between 2.13 and 5.46 percent from the baseline level. Thus, under this strategy, the country continues with its challenge of exporting raw materials with an unmet local demand for processed foods and thus increased processed food import bill. All the non-food sector imports also increase, as trade-offs exist between these exports and that of the non-food primary products like cotton and forestry products that are used as raw materials in the agro-manufacturing industry. This further enlarges the import bill for agro-manufacturing products.

Figure 6.3: Changes in real exports in agro-processing industries (2025)



Source: Tanzania model results

Figure 6.4: Changes in real imports in agro-processing industries (2025)



Source: Tanzania model results

Changes in Trade Structure

The structure of imports and exports also changes in response to the differential growth rates of exports and imports across the various sectors (Table 6.4).

Table 6.4: Sectoral share in total real exports and imports (2025)

	INITIAL (2016)	BASE	TFP	PWE	TFPwe	EDUC	AGTFP
Share in total exports (%)							
Agriculture	17.18	12.64	12.26	11.13	10.74	12.64	15.34
Crops	17.03	12.49	12.11	10.99	10.61	12.49	15.16
Livestock	0.08	0.08	0.08	0.08	0.07	0.08	0.11
Forestry	0.02	0.01	0.01	0.01	0.01	0.01	0.02
Fisheries	0.05	0.05	0.05	0.05	0.05	0.05	0.06
Industry	46.69	54.75	55.06	56.89	57.32	54.59	51.99
Mining	29.04	35.33	34.92	33.18	32.61	35.33	32.91
Agro-processing	10.35	11.31	12.09	15.84	16.92	11.17	11.34
Food	*6.77*	*6.81*	*7.27*	*9.41*	*10.04*	*6.66*	*7.17*
Non-food	*3.58*	*4.50*	*4.81*	*6.43*	*6.87*	*4.51*	*4.17*
Other manufacturing	7.30	8.11	8.06	7.87	7.80	8.09	7.74
Services	36.12	32.61	32.68	31.98	31.94	32.78	32.67
Share in total imports (%)							
Agriculture	2.19	1.94	1.94	1.95	1.95	1.94	1.92
Crops	2.08	1.83	1.83	1.82	1.82	1.82	1.83
Livestock	0.04	0.05	0.05	0.06	0.06	0.05	0.04
Forestry	0.07	0.06	0.06	0.06	0.06	0.05	0.04
Fisheries	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industry	76.91	78.53	78.44	78.33	78.22	78.61	78.31
Mining	0.52	0.46	0.47	0.48	0.49	0.46	0.48
Agro-processing	11.09	9.90	9.73	10.05	9.90	9.91	9.97
Food	*6.33*	*5.55*	*5.45*	*5.66*	*5.57*	*5.56*	*5.59*
Non-food	*4.76*	*4.35*	*4.29*	*4.40*	*4.34*	*4.34*	*4.37*
Other manufacturing	65.08	68.02	68.09	67.64	67.67	68.10	67.71
Other industries	0.22	0.14	0.15	0.15	0.16	0.14	0.15
Services	20.91	19.53	19.62	19.72	19.83	19.45	19.77

Source: Tanzania model results

Exogenous productivity increase in agro-processing (TFP) leads to a further decline in the share of agricultural exports by 0.38 percentage points from the baseline values. At the same time, the industrial share in exports further increases by an additional 0.31 percentage points from the baseline value, solely driven by the expanding agro-processing exports whose share increases from the baseline share of 11.31 percent to 12.09 percent. The share of other industrial exports decline. Productivity-driven growth in the agro-processing sector will also result in a slight increase in the share of service exports by 0.08 percentage points. With regards to imports, the share of primary agricultural imports remains unchanged but a slight shift in shares of industrial and services imports is recorded. Share of service imports increases (+0.09) while the total industrial imports share decreases, mainly due to significant import substitution in agro-processing as other industrial subsectors slightly increase their shares.

The strategy to industrialise through foreign market expansion (PWE) significantly increases the share of industrial exports by an additional 2.14 percentage points from the baseline level due to the rapid expansion in agro-related manufacturing exports. Consequently, agriculture's share in exports further

decreases by 1.51 percentage points while the share of service exports also decreases by 0.63 percentage points from the baseline shares. Like in the productivity scenario, changes in imports structure are only due to shifts in shares of industrial and service imports. A decrease in the share of industrial imports is recorded despite the slight increase in the share of agro-processed imports. Share of services imports on the other hand slightly increases.

The combination of productivity increases and foreign market expansion (TFPwe) results in a higher magnitude of changes in the trade structure when compared to the effect of the two individual strategies. The share of total agro-processing exports increases from the baseline value of 11.31 to 16.92 percent. Though other industrial exports' share decreases, the total share of the industry exports records the highest increase of 2.57 percentage points above the baseline share. The strategy results in the least share of raw agricultural exports of 10.74 percent which is 1.9 percentage points lower than the BASE share. Share of service exports also declines by 0.67 percentage points compared to the baseline level. With regards to imports, the combined strategy results in the highest decreases in the share of industrial imports while the share agricultural and services record some slight increases.

Increasing educated labour (EDUC) on the other hand only changes the export shares of the industry and service sectors while that of agriculture remains unchanged. Compared to the baseline projections, industrial exports will decrease their share in total exports by 0.16 percentage points while service exports increase by 0.17 from the baseline share 32.61percent. The strategy, however, does not effect change in the share of raw agricultural imports. The share of processed agricultural products, as well as that of other manufactured products, slightly increases resulting in a small increase in the share of industrial imports. Conversely, the share of services imports decline.

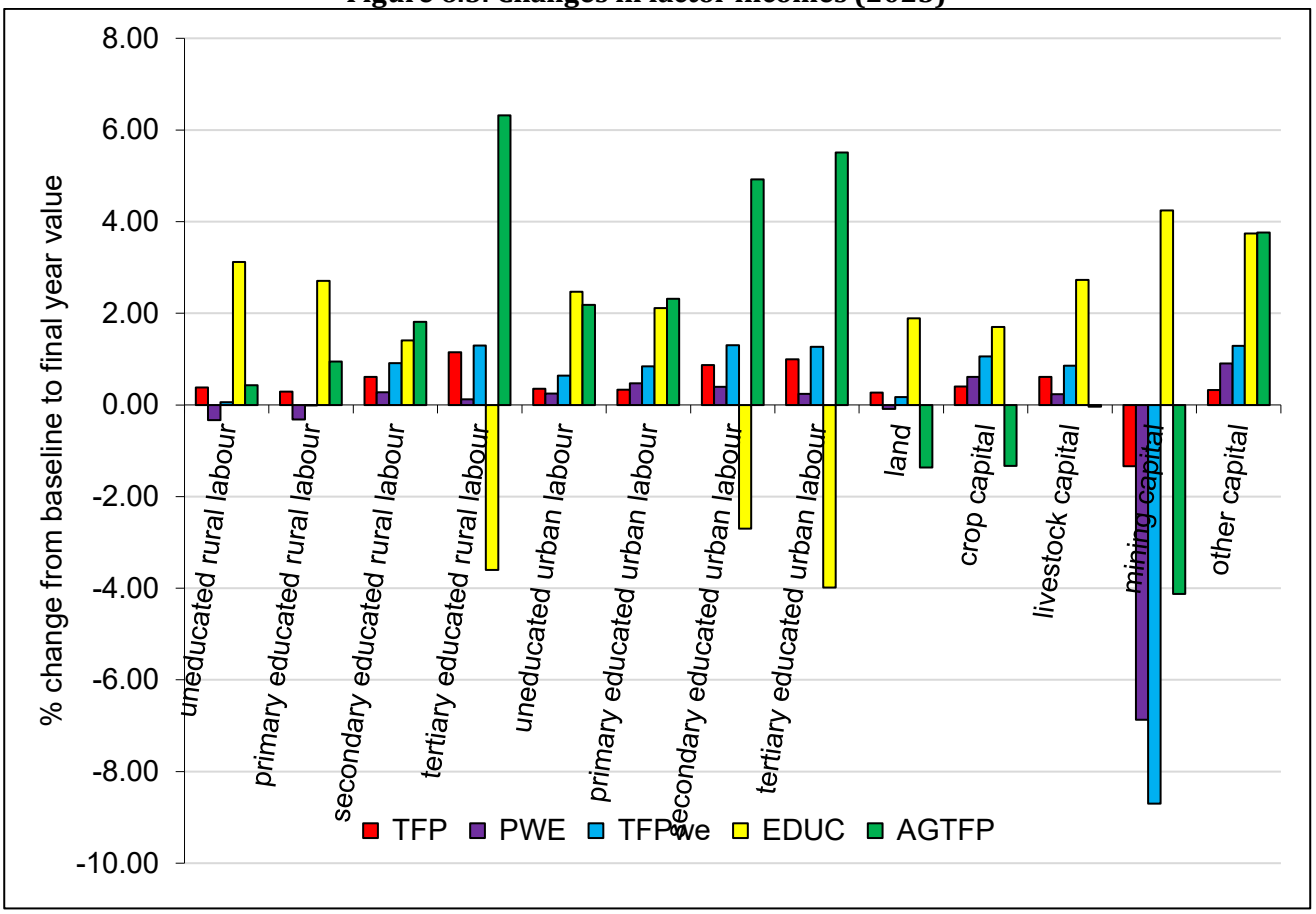
Productivity increases to expand primary agricultural production (AGTFP) will increase the share of raw agricultural products from 12.64 percent in the baseline to 15.34 percent. This is the highest share for agricultural exports compared to all other scenario results. This will be at the expense of the share of industry exports which decreases by 2.76 percentage points from the baseline level. The share of services, on the other hand, slightly increases by 0.06 percentage points compared to the baseline export share. The import substitution of raw agricultural products reduces the share of agriculture in total imports. A trade-off exists with the imports of agro-related manufactures whose share slightly increases. However, the total share of industrial imports slightly decreases. Imports share of services, however, records a slight increase.

6.6. Impact of policies on factor incomes

This section presents the changes in factor incomes emanating from the implementation of the various policy strategies. The impacts of the different policy simulations on factor incomes are presented in Figure 6.5. While changes in factor incomes capture a combination of changes in factor demand and

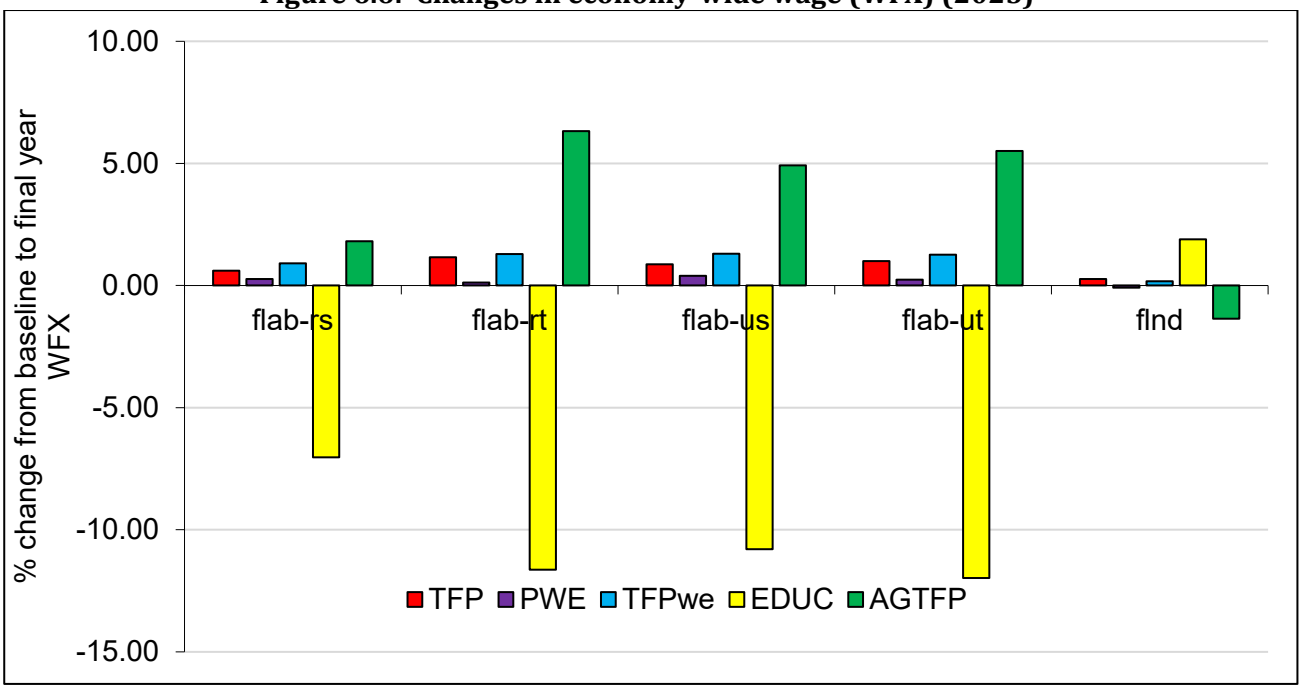
wage rates, only the changes in wage rates are presented in this section (Figure 6.6) but the discussion will include both changes in wage rates and factor use.

Figure 6.5: Changes in factor incomes (2025)



Source: Tanzania model results

Figure 6.6: Changes in economy-wide wage (WFX) (2025)



Source: Tanzania model results

TFP

Productivity-driven growth in the processing of agricultural products positively impacts factor incomes. Except for mining capital, all the other factors record additional increases to their returns in the baseline. The returns to mining capital (only employed in the mining sector) decrease by 1.34 percentage points from the baseline. Due to limited linkages between the two sectors, growth in agro-processing does not spur growth in the mining sector thus decreasing the demand for capital in the mining sector and consequently the factor's rent. On the other hand, the income from land as well as crop and livestock capital increases reflecting the impact that the expansion of the processing sector has on primary agricultural production. The increased demand for intermediates from agriculture, due to the expanding processing sector, derives the demand for factors of production of the raw agricultural products. The agricultural sectors' activity-specific wage (WFDIST) for the two types of capital and land therefore increases and thus the total income for the factors increases. The incomes from other capital, which includes capital for agro-processing and other industrial and service sectors, also increases. Though the productivity increase results in a decrease in the capital-output ratio in the agro-processing sector resulting in the decrease the factor's demand in the related industries, the expansion in the other sectors increase the demand for the capital and hence the increase in the factor income. In both urban and rural areas, tertiary-educated labour records the highest income increases, followed by secondary educated, then the uneducated and lastly primary educated labour. The changes in the incomes of these labour categories are proportional to the initial average wages for each category.

PWE

The foreign market access expansion strategy has a similar effect on the returns to capital as the productivity-driven growth strategy. The strategy has significant impacts on the capital of both the primary agriculture and processing sectors. The incomes from other capital (which includes agro-processing and other non-primary activities') record the highest increases (+0.90 percentage points) from the baseline, followed by crop and then livestock capital. This export-oriented strategy results in a decrease of greater magnitude in the income of mining capital (-6.87 percentage points compared to the baseline values). Unlike with productivity increase in agro-manufacturing, the economy-wide wage rate for land, on the other hand, decreases by 0.089 percent from the baseline leading to the decrease in the returns to land under this strategy. This is mainly because the export-oriented strategy does not create enough linkages with the local primary activities and also makes raw product exports unattractive. The resultant effect is a decrease in agricultural expansion and a rise in demand for imports, which in turn, decreases the demand for land, causing a fall in the wage rate of land. Decreases in quantity demanded for land is recorded mainly in export-oriented agricultural sectors such as pulses, tobacco, rice, fruit, wheat and coffee. The strategy also has a negative effect on the incomes of less-educated labour in rural areas. The decreased expansion in primary sectors, especially the export-oriented sectors, in which this labour is mainly absorbed, is a major drawback as some workers are laid off. The total income from this

labour category therefore decreases. Contrary, the more educated labour gains increase as more of this labour is demanded by exporting sectors.

TFPwe

The combined effect of productivity and exports-driven growth has greater positive impacts on almost all factor incomes, mining capital and primary-educated rural labour being the exception than the effect of the two individual policies. The strategy leads to an increased demand for factors capital and educated labour leading to increased wages. The returns to land also increase due to increased demand for the factor derived from the need for an increase in agricultural production to supply the expanding downstream sectors. On the other hand, a huge negative effect on the income for mining capital is experienced while the income for primary educated rural labour slightly decreases.

EDUC

Increasing secondary and tertiary educated labour have mixed results on factor incomes (Figure 6.5). Due to the increased supply of labour, wages of the secondary educated- and tertiary educated rural labour decreased by 7.4 and 11.63 percent, respectively, compared to the baseline values while that of the urban secondary educated and tertiary educated labour decreased by 10.80 and 11.98 percent from the baseline values. The incomes of secondary educated labour with relatively lower decreases in wages did not decline while the other labour categories whose wages fell recorded negative impacts on incomes. Incomes for the less educated labour with unlimited supplies increases due to increased demand for these factors in the expanding labour intensive sectors. Expansion of the agricultural, industry and service sectors results in increased incomes of land and capital used in these industries as the demand for these factors increases to meet production.

AGTFP

Productivity-driven agricultural expansion has more pronounced income improvements for all labour categories than the effects of policies directly implemented in the agro-processing sector. In general, the increase in incomes from labour in urban areas is greater than that of rural labour with the same education, save for tertiary-educated labour. The magnitude of the changes in the labour incomes in both rural and urban areas are influenced by the level of education. The higher the educational level, the larger will be the additional income to the labour category. On the other hand, the capital and land employed in agriculture, which is fully employed, receive lower incomes than in the baseline. The productivity increases in the sector imply that less of the factors are now required to produce the same quantity as before. Despite the decrease in its demand in the agricultural sector, there is a higher demand for labour in the non-agricultural expanding sectors and hence the labour released from agriculture is absorbed in these sectors. This explains, therefore, the increase in labour incomes. Conversely, the specificity of land and agricultural (livestock and crop) capital implies that the decreases in demand of the factors in the sector translate to decrease in total employment of the factors as they

cannot be absorbed in any other sector. Wages for the factors therefore decrease and thus the total income. The wage rate of land decreases by 1.36 percent (Figure 6.6).

6.7. Impact of policies on household incomes

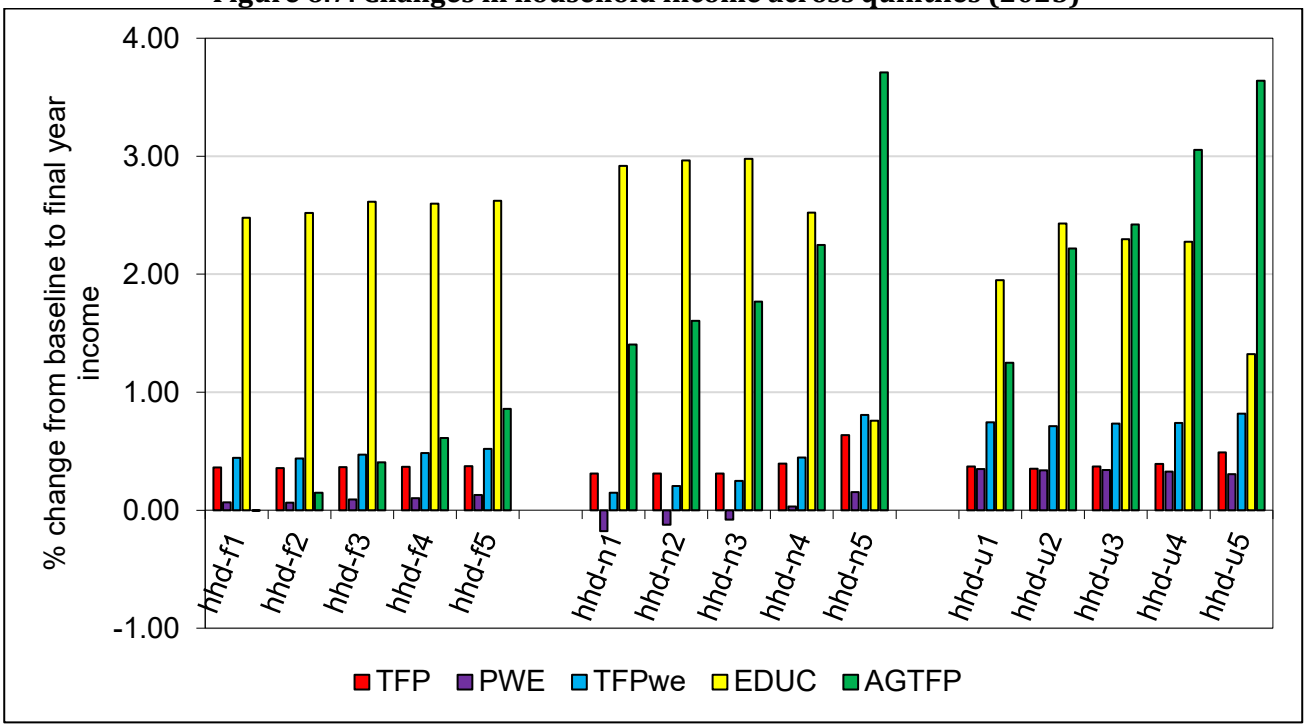
The various policies influence household incomes as presented in both Figure 6.7 and table 6.5. The results are presented as percentage income changes from the final year baseline income for each household category. Comparison is made between rural and urban households income changes and between the income quintiles.

Table 6.5: Changes (%) to incomes of rural and urban households from baseline incomes (2025)

	TFP	PWE	TFPwe	EDUC	AGTFP
Rural farm households	0.37	0.10	0.48	2.58	0.48
Rural non-farm households	0.52	0.07	0.61	1.59	2.97
Urban households	0.46	0.31	0.80	1.55	3.42

Source: Tanzania model results

Figure 6.7: Changes in household income across quintiles (2025)



Source: Tanzania model results

TFP

Under the productivity scenario, household income improvements are attained both in rural and urban areas as well as across all income quintiles in these locations. Compared with baseline incomes, productivity increases have the highest positive impacts on rural non-farm households, followed by urban households and lastly rural households (Table 6.5). This is explained by the fact that the highest

returns to factors are from labour which constitutes a greater portion of the rural non-farm households incomes while the land which contributes a significant portion to farm households has the least improvements in earnings. When looking at the income quintiles, the general trend is that the higher income quintile, the higher the additional household incomes compared to the baseline incomes, in both the rural and urban households. Higher-income quintiles receive a significant share of their incomes from educated labour whose incomes significantly increase under the productivity scenario (shown in the previous section).

PWE

At a broader level, export-driven growth also has a positive impact on both rural and urban household incomes. The improvements are however of a low magnitude compared to productivity-driven growth. The urban households receive the highest income improvements followed rural farm and then the rural non-farm households (Table 6.5). There are, however, differences in how the income quintiles are affected within these broad household classifications. The rural farm households experience positive income changes in all income quintiles. The magnitude of the household income change in these households is proportional to the income quintile, that is, the higher the income quintile, the larger the change in income. Mixed results are observed in rural non-farm households - the lower three quintiles' incomes decrease while the upper two quintiles receive a boost to their incomes. The changes are mainly a reflection of the changes in factor incomes. The decrease in less-educated labour incomes (Figure 6.7) from which the lower-income quintiles derive their main source of income negatively affected the total incomes of these households. The rural non-farm upper-income quintile households, on the other hand, are dependent on more educated labour whose earnings improve significantly adding to the total incomes of the households. In urban households, the magnitude of the income improvements will decrease with the level of income. This again is based on changes in factor incomes. The lower-income quintiles are more dependent on the labour and capital whose incomes increase under this strategy. On the other hand, higher urban income quintiles receive a considerable part of their income from entrepreneurship.

TFPwe

The combined strategy has the highest income improvements in urban households followed by rural non-farm, with the least changes happening to rural farm household incomes (Table 6.5). Again, this is reflective of changes in factor incomes as explained in the previous section. The highest improvements in factors under this strategy are observed in the capital and educated labour incomes. The incomes from these factors comprise a larger share of urbanites' and the rural non-farm's incomes than for the farmers. Fewer gains are recorded in less-educated labour which provides the largest share of rural farm household incomes. Within all these broad household groups (rural farm, rural non-farm and urban), higher-income improvements are observed in higher-income quintiles. The higher the quintile of the household, the higher is the additional income to that household.

EDUC

In the education scenario, the results are also a reflection of the changes in factor earnings from which the households derive their incomes. Among the rural farm households, the higher the income quintile, the higher is the household income. For the rural non-farm households, the income increases with the increase in quintiles also, but only for the lower quintiles as the top two quintiles' income changes are lower. The top income quintiles are lower due to the reduced incomes from highly educated labour which constitute a significant source of income for these households. Overall, compared to the baseline, the highest increases in incomes is observed in the farm households (+2.58 percent), followed by the rural non-farm households (+1.59 percent) and then the urban households (+1.55 percent).

AGTFP

The benefits of productivity-driven agricultural expansion do not necessarily accumulate more to farming households. The results of the simulation show that farm households have the least gains in incomes, followed by rural non-farm, while the urbanites receive the highest boost in incomes (Table 6.5). In addition, there is a higher divergence between the changes in farm households' incomes and other households. This is due to the decrease in the earnings of land and agricultural capital as well as the low expansion of less-educated labour incomes from which most of the farm households derive their income from. This is also reflected across the income quintiles in both the rural and urban households. The income improvements are higher as the income quintile increases (Figure 6.7) because of the large increases in the educated labour incomes from which upper-income quintiles derive their income from.

6.8. Impact of policies on household welfare

In this study, the equivalent variation (EV) is used to evaluate household welfare. The equivalent variation is an important measure widely used in CGE analysis to quantify, ex-ante in this case, the welfare effects of policy shocks. This measure considers the changes in household incomes and price changes given the consumption bundles (Pauw et al., 2007). It estimates, at the base price values, the required change in income that would give the consumer the same satisfaction (utility) as that which would have been brought by the economic shock should it have taken place (Sennoga and Matovu, 2016). Positive EV would imply welfare gains while negative EV implies welfare losses.

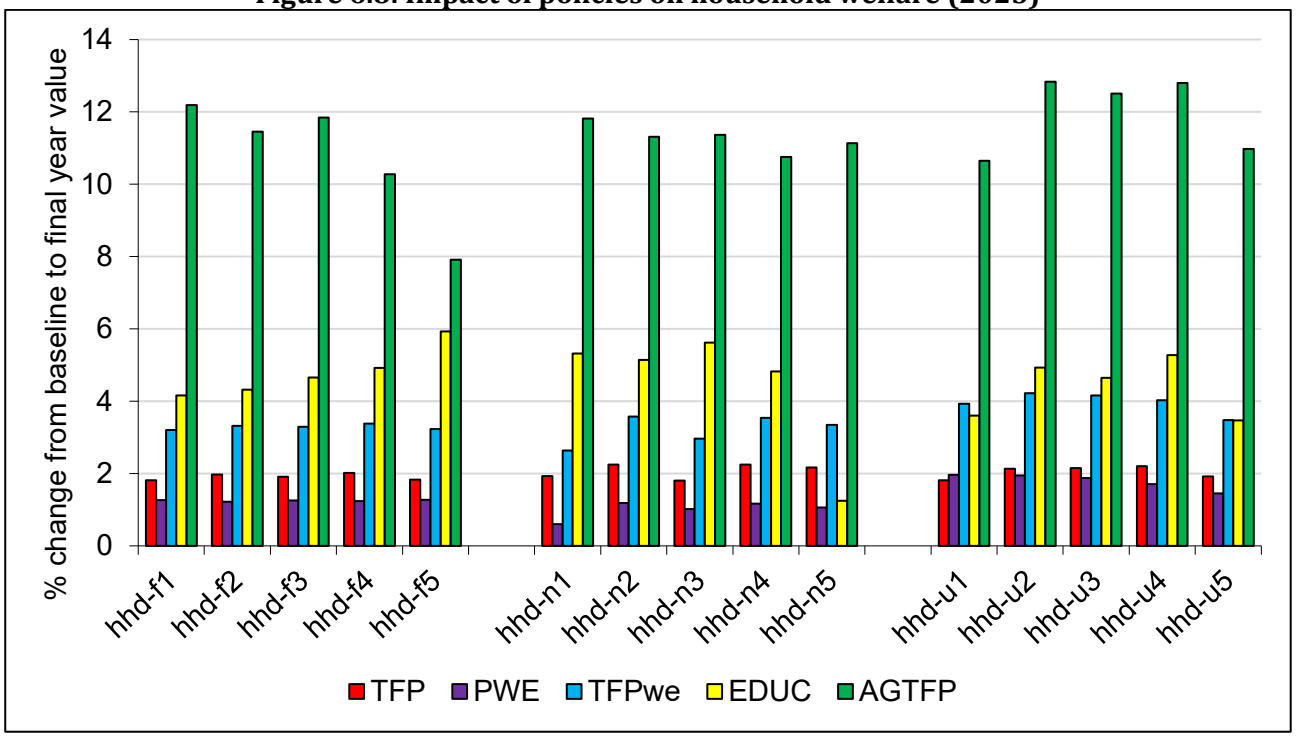
The changes in welfare under the simulated policies to foster industrialisation are presented in Table 6.6 and Figure 6.8. The results are presented as deviations of the EV value in each simulation from the baseline EV value in 2025. The model results show positive EV changes for all simulations implying that there are welfare gains from implementing such policies in the industrialisation process. The welfare changes are mainly influenced by the changes in incomes discussed in the previous section.

Table 6.6: Changes (%) in rural and urban households' welfare from baseline (2025)

	TFP	PWE	TFPwe	EDUC	AGTFP
Rural-farm households	1.92	1.25	3.29	4.91	10.47
Rural-nonfarm households	2.15	1.07	3.34	2.83	11.12
Urban households	1.98	1.53	3.62	3.85	11.38

Source: Tanzania model results

Figure 6.8: Impact of policies on household welfare (2025)



Source: Tanzania CGE model results

TFP

Under the productivity-driven growth (TFP) strategy, the rural non-farm households have the highest welfare improvements, followed by urban households, with rural farm households having the least welfare improvements (Table 6.6). Across the quintiles, the changes do not perfectly resemble the households' income improvements. The welfare changes range between 1.8 and 2.0 percent for rural farm household quintiles and between 1.8 and 2.2 percent for both rural non-farm and urban household quintiles.

PWE

The changes in welfare in the broad household groups under the export-driven growth agro-industrialisation are shaped by the changes in households' incomes. The urbanites enjoy the highest welfare improvements followed by rural farm households with the least improvements being in rural non-farm households (Table 6.6). The improvements from the baseline welfare across the quintiles range between 1.2 and 1.3 percent for the rural farm households, 0.6 and 1.1 percent for rural non-farm

households and 1.4 and 2.0 percent for urbanites (Figure 6.8). This reflects the dominance of agro-processing activities in urban areas.

TFPwe

The deviations from the baseline welfare values are between 3.2 and 3.4, 2.6 and 3.6, and 3.5 and 4.2 percent among the rural farm, rural non-farm and urban household income quintiles, respectively. Thus, combined productivity and market expansion will improve the welfare of Tanzanians than the effect of the two individual policy strategies.

EDUC

Increasing the educated labour results in higher improvements in welfare than the vertical policies for agro-processing development (Figure 6.8). At an aggregated household level, greater welfare improvements are observed in the rural farm households, followed by urban households, while the rural non-farm households record the least improvements in welfare (Table 6.6). When the impacts on welfare are examined across income quintiles (Figure 6.8), the changes are in line with the changes in household incomes. The welfare improvements are range between 4.2 and 5.6 percent from the baseline in the rural farm households, with improvements increasing with the increase in quintile. Welfare improvements among rural non-farm household quintiles are between 1.2 and 5.6 percent above the baseline EV while that of urban households are between 3.5 and 5.6 percent higher than the baseline welfare values.

AGTFP

The expansion of the primary agricultural sector gives larger welfare improvements for all household categories compared to the other strategies. The highest welfare improvements are observed in urban households, followed by the rural non-farm and then farm households. Though the welfare changes are shaped by changes in incomes, the gap between the welfare improvements of the rural farm households and the other households is not as large as it is with the household income changes. Across the income quintiles among the broad categories, welfare changes from the baseline range between 7.9 to 12.2 percent in rural farm households, 10.8 and 11.8 in rural non-farm households and between 10.7 and 12.8 percent for urban households.

6.9. Sensitivity Analysis

The sensitivity analysis was focused on two of the simulations, the combined productivity increase and foreign market access (TFPwe) and the educated labour force expansion (EDUC) strategies. Two sensitivity tests were carried out for each of the simulations. In the first test, the S-I closure is changed to a savings-driven investment closure - the households' marginal propensities to save are assumed fixed. This implies that any income increases will result in higher levels of savings and investment. In the second test, the assumption that land is scarce is relaxed and perfectly elastic supply of land is

assumed. This implies that land is readily available to farmers and they are free to utilize any amount at a fixed wage rate based on the demand. The other assumptions were kept the same as in the original TFPwe and EDUC simulations.

Tables A2 – A4 in the appendix presents the results of the changes in the variables due to the closure changes. When the investment is savings-driven or land supply is flexible, growth is accelerated under both the EDUC and TFPwe strategies but is more sensitive to changes in assumptions on savings. While agriculture expands more rapidly under the flexible land supply, the performance of the non-food sector is negatively affected in both the combined and the education strategy. GDP and export growth slow down while imports increase (Table A3).

The more educated labour's incomes in both policy strategies are negatively affected by the savings-driven investment. Flexible land supply, on the other hand, has a negative effect on the rural less-educated labour as well as crop capital. This might be a reflection of some substitution between these inputs of agricultural production (Table A4).

Incomes for farm and non-farm rural households in the lower-income quintiles respond negatively to a flexible supply of land under both policy strategies. On the other hand, all household incomes improve in both scenarios when investment is savings driven (Table A5).

6.10. Conclusion

Against the emphasis on industrialisation on the Tanzanian development agenda and the priority accorded to agro-processing, a recursive dynamic CGE model was used to examine the economy-wide ex ante effects of policies that can enhance agro-processing. Five scenarios were created to simulate policies aimed at i. increasing productivity in agro-processing activities, ii. pushing exports of agro-processed products, iii. simultaneously increasing productivity and pushing exports of the agro-processing sector, iv. increasing the quantity of educated labour, and iv. expanding agricultural production. The analysis compares the effects of each policy simulation to the baseline projections on economic growth and structure, sectoral production, trade growth and structure, factor and household incomes and household welfare.

The impacts of the simulated policies on economic growth are modest. Increase in average annual GDP growth rate under the policies ranges between 0.01 and 0.32 percentage points above the baseline growth rate. The policies directly implemented on the agro-processing activities generally have the lower growth rates, the least being under the export strategy, while the results are relatively higher in the other policy simulations. The strategy to expand agricultural production results in the highest growth in GDP. In the agro-processing sector, growth is more rapid under directly implemented policies, with larger impacts observed under the combination productivity increase and export push. Changes to the economic structure are also modest except under the agriculture-led industrialisation strategy

where the share of agriculture in GDP increases by 1.43 percentage points above its share in the baseline.

Increases in production are recorded in all agro-processing activities under increased productivity strategy as well as under the combined strategy. On the other hand, the export push strategy negatively affects the non-exporting agro-processing industries. The exchange rate appreciation under the agro-processing sector-specific policies will, however, result in less production in the exporting non agro-processing industries. On the other hand, the strategy to increase educated labour enhances production in sectors that employs a fair share of educated labour while the agricultural expansion strategy has a reduction effect on output of mining, wood and paper and other manufacturing industries perhaps due to weak linkages between these industries and the agricultural sector.

Trade outcomes differ across the policy simulations. Additional annual growth in exports of agro-processed products range between 0.09 and 4.37 percentage points above the baseline growth rate. The highest growth in agro-processed exports is observed under the combined strategy while the strategy to increase education results in the least expansion of the exports. In general, growth in exports of non-food agro-processed products is higher than that of food products. Total export growth is however higher under the policies that are indirectly implemented for agro-processing sector's expansion. Food export growth is also higher under the agricultural production expansion strategy. With regards to imports, agro-processed products import growth is lower when productivity is increased in the agro-related manufacturing activities. Import substitution takes place. Import substitution does not however take place under the export strategy as the highest growth in imports of agro-processed products are recorded. The total import growth is recorded under the agriculture expansion strategy which also results in a fair increase in agro-processed imports.

When considering factor incomes, productivity-driven growth in agro-processing expands labour incomes as well as returns of capital and land in primary agriculture. The educated labour, however, benefits more from productivity increases. Conversely, the export push strategy has a negative impact on less-educated rural labour and land. The combined strategy generally improves the majority of the incomes, but the influence of the export strategy results in less increases to incomes of less-educated labour and land as compared to the outcomes of productivity increase in the agro-processing sector. The strategy to expand the educated labour, on the other hand, may reduce the returns to the educated labour due to a fall in wages. The earnings from land and crop and livestock capital are negatively affected under the agricultural production expansion strategy. This is because a fall in wages of these factors due to the increased productivity is not complemented by a large increase in demand for the factors.

Household incomes generally reflect the changes in factor incomes. Increased productivity in agriculture will not necessarily benefit the rural low-income quintile households mainly because of the negative impact the strategy has on land and crop capital. A broad analysis shows that incomes are higher under the combined strategy than under the two individual policies. The impacts of the education and agricultural expansion strategies are generally higher than that of the strategies directly implemented in the agro-processing sector. The results, however, show variations among the income quintiles.

Chapter 7: Conclusion and Recommendation

7.1. Introduction

The Sub-Saharan Africa region has grown rapidly in recent years owing to the improved macro-economic management and favourable external factors. The high growth rate has, however, not been accompanied by a significant rise in incomes, the creation of quality employment and the uplifting of the majority of Africans out of poverty. In other regions, such challenges were addressed with high levels of economic growth. There is a growing realization that what is missing in Africa is a substantial structural transformation that accompanied the rapid growth in developed countries. There is thus an increasing consensus that Africa needs to industrialise to ensure successful transformation.

In Tanzania, economic transformation and industrialisation are on top of the development agenda and agro-processing has been accorded priority in various related development plans. This is due to the perceived positive impacts of the sector's expansion on the economy. A number of policies have thus been proposed and are being implemented to ensure industrialisation. There is however lack of substantial empirical evidence on the economy-wide impacts of the agro-processing sector's expansion and the various outcomes of the policies aimed at expanding the sector. This study filled the gap by examining the impacts of five policy strategies to expand the agro-processing activities using an economy-wide model.

7.2. Summary of the thesis

Given the emphasis of economic transformation, industrialisation and the development of agro-processing, a literature review was done in chapter 2 to understand the relevance of these issues in economic development. The literature highlighted that economic development has generally been viewed as a process of economic (structural) transformation. Economic transformation involves structural change, the movement of labour and other resources from low productivity to high productivity sectors, and its interrelated process which include urbanization and demographic transition. Historically, the movement has been from agriculture to industrial activities first at low-income levels and then to services at a later stage in the development process. It is evident that in countries where this structural transformation does not take place, socio-economic challenges of poverty prevail. The pace and scope of economic transformation is the distinguishing phenomenon between poor countries and rich countries.

Industrialisation, particularly manufacturing, has been associated with virtually all cases of successful transformation. Manufacturing possesses special attributes that are synonymous with economic development. Compared to other industrial activities, manufacturing can absorb a number of moderately skilled workers and the activities offer opportunities to learn by doing. Productivity in manufacturing is higher than in agriculture and the transfer of labour from the less-productive sectors

into these manufacturing sectors will result in significant improvement in economy-wide productivity. Structural change in today's successful countries was mainly diversification towards manufacturing. In successful countries, governments have always played a major role in industrialisation through industrial policy. This entails supporting certain industries to accelerate economic transformation. Success in African countries will also depend on effective policies.

Agro-processing activities form part of manufacturing activities that transform raw materials and intermediate products from agriculture, forestry and fisheries. In developing countries where agriculture constitute the majority of economic activities, agro-processing can be a viable opportunity for industrialisation. These activities are also labour-intensive and can absorb a large share of unskilled labour that might remain trapped in agriculture. Thus, the expansion of these activities can accelerate structural transformation. Agro-processing activities present opportunities for better jobs, higher incomes and expands higher-value exports while reducing dependence on raw material exports.

In chapters 3 and 4, an analysis was done to understand the prevailing socio-economic conditions in Tanzania, and the relevance of agro-processing expansion. The analysis revealed that industrialisation and economic transformation are still to take place. Agriculture still accounts for the largest share in employment and has a substantial share in exports while services hold the largest share in output which is unusual considering the economy's level of income. The contribution of manufacturing activities in the economy has remained limited. This lack of structural change has resulted in the high growth not being accompanied by substantial reductions in poverty and the creation of quality jobs. With Tanzania set to become a middle-income economy by 2025, there is need to industrialise and ensure rapid economic transformation. Agro-processing activities have the potential to lead the process of economic transformation. A number of challenges, however, limit the expansion of the agro-processing in Tanzania and will need to be addressed through industrial policy. Such challenges include, among others, poor infrastructure and lack of enough investments which results in low productivity in the industries, low level of skilled and educated labour and unreliable input supplies.

Against this background, the study examined the economy-wide impacts of agro-processing expansion in Tanzania. The investigation was done through simulating the impacts of policies aimed at improving productivity in agro-processing, expanding export markets for agro-processed products, increasing the quantity of educated labour, and increasing agricultural production to support the expansion of processing activities. These simulations were informed from both current literature on ways to enhance industrialisation as well as the Tanzanian government's current and proposed plans towards the industrialisation of the economy. A recursive dynamic computable general equilibrium model which was developed by the International Food Policy Research Institute (IFPRI) was applied for the simulation analysis. The model was calibrated to the 2016 Tanzanian Social Accounting Matrix (SAM) which was constructed under the IFPRI Nexus Project.

The results show that the strategy to increase productivity in agro-processing will enhance the sector's competitiveness resulting in increased exports. The exports of low-value primary exports will also be reduced. In addition, significant import substitution of processed foods will occur due to productivity improvements in the agro-processing sector. However, non-food agro-processed imports are not likely to be substituted by the expanding local production probably reflecting capacity constraints in the sector. A broad analysis shows that non-farm households benefit more from productivity increases.

The export strategy, on the other hand, will even be more effective in expanding agro-processed products exports. However, production under this strategy is limited. Production of both food and non-food agro-processed products will not meet the domestic demand and leading to an increase in imports. Focusing on export markets alone will thus pose a challenge to economic growth. The strategy will not result in significant increase in household incomes and some low-income quintile non-farm households will be negatively affected.

A combination of productivity increases, and export market-oriented growth is crucial for agro-expansion. Growth within the sector and overall economy is higher than in the individual strategies. Agro-processed products export growth is also higher under the combined strategy and import substitution for these products also. In addition, household incomes are generally higher than under the individual strategies.

The horizontal policy to expand the educated labour force, on the other hand, results in high additional economic growth, and higher total exports and imports. However, its impact on the growth of the agro-processing activities is less pronounced. Exports of the food industry decrease significantly while the non-food sector exports increase due to increased educated labour but imports of all agro-processing activities increase. Significant increases in household incomes are recorded under this strategy. Generally, farm households benefit more from this strategy.

Agricultural expansion through productivity increases will result in the rapid growth of the economy. Though agro-processing growth will also accelerate under this strategy, its expansion will not be as much as it would be under the policies that are directly implemented on the sector. Agricultural expansion will, however, enhance exports from food industries and in some cases even lead to import substitution of food products. However, non-food agro-processed imports will expand. Increased productivity in agriculture will not necessarily benefit the rural low-income quintile households, mainly because of the negative impact the strategy has on land and crop capital. Significant income increases are however recorded in the rural non-farm and urban households.

7.3. Concluding remarks on findings

The findings suggest that agro-processing activities play an essential role in the Tanzanian economy. Expansion of the activities will be crucial for boosting the country's exports and reducing dependence

on raw material exports. Hence the Tanzanian government should continue to implement policies to encourage more investments in the sector. The results of expansion of the sector on structural change are however small due to as the sector constitutes only a small share in both value-added and employment.

Sector-specific strategies will be important for the expansion of the agro-processing sector. Productivity increases in the agro-processing sector will be of importance in increasing production, expanding the sector's exports, reducing low value exports and substituting imports of processed foods which are increasing the food import bill. Efforts should thus be made towards initiatives that will raise productivity in the sector, such as increasing FDIs. Export push strategies will boost exports but without improving the sector's capabilities, growth will slow down. Based on the analysis the recommendation will be that the government should prioritise policies that will increase productivity.

Horizontal policies will also play an important role in the economy. Policies such as increasing education may not necessarily be sufficient for the sector's expansion but are crucial for expansion of the whole economy. On the other hand, productivity increases in agricultural activities will also be crucial to expand the input base for agro-processing activities.

The simulation analysis also highlights that policy outcomes among the subsectors within the agro-processing sector may differ. Thus, policies must be targeted at the subsector level.

7.4. Recommendations for further research

The study analysed the impacts of policy on agro-processing expansion, economic growth and structure as well as factor and household incomes. The policy simulations were implemented on the whole agro-processing sector, but the findings show subsectors are affected differently by the policy strategies. It is therefore recommended that future research be focused on subsector level and elucidate the impacts of targeting the selected subsectors of the agro-processing sector. In addition, did not elucidate employment issues which are an important part of structural transformation due to lack of actual employment figures among the activities. The recommendation is that future research must incorporate employment data and analyse the changes.

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Appendix

Table A1: Activities and commodities

AGRICULTURE		INDUSTRY		SERVICES	
Crops					
maiz	maize	***Food Agro-processing***		trad	trade and transport
rice	arice	meat	meat processing	hotl	hotel and restaurants
whea	wheat	fsea	fish and seafood	educ	education
ocer	other cereals	dair	dairy industry	orsv	other services
puls	pulses	fveg	vegetable processing		
oils	oils	foil	oilseed processing		
root	roots	mill	grain milling and feed		
vege	vegetables	asref	sugar refining		
sugr	sugar cane	pcof	tea and coffee		
toba	tobacco	food	other food processing		
cott	cotton	beve	beverages		
frui	fruits and nuts				
coff	coffee and tea	***Non-food Agro-processing***			
ocrp	other crops	ptob	tobacco processing		
		text	textiles and yarn		
Livestock		clth	clothing		
catt	cattle	leat	leather		
milk	milk	pwod	wood and paper		
oliv	other livestock				
		Other Industries			
Forestry		omin	mining		
fore	forestry	oman	other manufacturing		
		oind	other industries		
Fishing					
fish	fishing				

Table A2: Relationship between trade and production/demand

Export share of total domestic output in 2025 (%)							
	2016	**2025**					
	INITIAL	**BASE**	**TFP**	**PWE**	**TFPwe**	**EDUC**	**AGTFP**
Agriculture	11.52	9.65	9.25	8.23	7.82	9.70	12.03
Crops	19.44	16.21	15.59	13.95	13.29	16.31	20.00
Livestock	0.30	0.32	0.31	0.28	0.26	0.31	0.42
Forestry	0.11	0.11	0.11	0.10	0.09	0.11	0.16
Fisheries	0.38	0.46	0.45	0.44	0.43	0.45	0.50
Industry	12.32	17.39	17.28	17.49	17.35	17.44	16.52
Mining	80.16	86.34	85.94	84.58	84.01	86.36	84.90
Agro-processing	10.59	13.19	13.93	18.40	19.30	13.05	13.49
Food	*9.66*	*11.44*	*12.09*	*15.91*	*16.72*	*11.25*	*12.18*
Non-food	*14.59*	*20.15*	*21.29*	*27.93*	*29.25*	*20.23*	*18.78*
Other manufacturing	11.87	14.74	14.45	13.86	13.48	14.70	13.82
Services	8.85	8.99	8.88	8.54	8.39	9.13	8.79
Trade and transport	6.98	8.01	7.92	7.70	7.57	8.03	7.68
Hotels and restaurants	53.25	54.36	54.05	52.29	51.75	54.81	54.73
Other services	2.06	1.93	1.91	1.86	1.83	2.01	1.84
Total exports	10.57	12.16	12.00	11.77	11.57	12.26	12.06

Import share of domestic demand in 2025 (%)							
	2016	**2025**					
	INITIAL	**BASE**	**TFP**	**PWE**	**TFPwe**	**EDUC**	**AGTFP**
Agriculture	2.11	1.97	1.95	1.93	1.91	1.97	2.03
Crops	3.39	3.15	3.11	3.06	3.03	3.15	3.28
Livestock	0.18	0.22	0.23	0.24	0.25	0.23	0.19
Forestry	0.50	0.51	0.51	0.53	0.54	0.50	0.44
Fisheries	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Industry	27.60	30.83	30.75	30.58	30.48	30.94	30.68
Mining	7.24	7.38	7.37	7.34	7.32	7.38	7.34
Agro-processing	19.17	19.26	19.05	19.40	19.21	19.32	19.40
Food	*13.60*	*13.60*	*13.40*	*13.74*	*13.55*	*13.67*	*13.74*
Non-food	*34.66*	*34.32*	*34.12*	*34.45*	*34.26*	*34.31*	*34.29*
Other manufacturing	67.12	68.18	68.08	67.87	67.73	68.16	67.86
Other industries	0.14	0.11	0.12	0.12	0.12	0.11	0.12
Services	6.13	6.01	5.99	5.94	5.91	6.05	5.92
Trade and transport	6.86	7.19	7.16	7.09	7.05	7.19	7.09
Hotels and restaurants	34.55	34.89	34.80	34.26	34.10	35.03	35.00
Other services	1.81	1.78	1.77	1.75	1.74	1.79	1.75
Total imports	15.36	16.37	16.29	16.16	16.06	16.47	16.29

Source: Tanzania model results

Table A3: Sensitivity analysis on GDP, export and import growth (2025)

	TFPwe scenario			EDUC scenario		
	Original closure	S-I closure	Land closure	Original closure	S-I closure	Land closure
GDP growth						
Agriculture	5.07	5.41	5.97	5.18	5.52	6.16
Industry	7.18	7.86	7.14	7.25	7.97	7.19
Agro-processing	8.32	8.73	8.43	7.04	7.41	7.16
Food	*7.96*	*8.33*	*8.21*	*6.85*	*7.19*	*7.07*
Non-food	*9.40*	*9.92*	*9.08*	*7.60*	*8.07*	*7.45*
Services	6.89	6.89	7.02	7.15	7.11	7.29
Total GDP	6.47	6.76	6.76	6.63	6.92	6.94
Exports growth						
Agriculture	2.47	2.83	4.93	4.59	5.04	7.21
Industry	10.44	11.09	10.14	10.12	10.79	9.69
Agro-processing	14.21	14.80	14.43	9.15	9.69	9.38
Food	*12.93*	*13.43*	*14.12*	*8.03*	*8.49*	*9.09*
Non-food	*16.41*	*17.13*	*15.04*	*11.06*	*11.71*	*9.93*
Services	6.48	6.84	6.68	7.06	7.43	7.28
Total GDP	7.94	8.47	8.15	8.22	8.77	8.45
Imports growth						
Agriculture	5.95	6.22	5.97	5.89	6.14	5.96
Industry	7.54	8.10	7.70	7.60	8.19	7.77
Agro-processing	6.00	6.44	6.27	6.00	6.41	6.30
Food	*5.81*	*6.27*	*6.01*	*5.80*	*6.22*	*6.01*
Non-food	*6.25*	*6.66*	*6.60*	*6.27*	*6.66*	*6.67*
Services	6.71	6.94	7.04	6.48	6.68	6.85
Total GDP	7.34	7.83	7.53	7.34	7.84	7.55

Source: Tanzania Model results

Table A4: Sensitivity analysis on factor incomes

	TFPwe scenario			EDUC scenario		
	Original closure	S-I closure	Land closure	Original closure	S-I closure	Land closure
uneducated rural labour	0.06	4.18	-3.94	3.12	7.31	-0.81
primary educated rural labour	-0.01	3.48	-2.97	2.71	6.30	-0.16
secondary educated rural labour	0.91	-0.30	3.45	1.41	-0.38	4.19
tertiary educated rural labour	1.29	-6.23	6.93	-3.60	-12.20	2.06
uneducated urban labour	0.64	2.27	1.85	2.47	3.98	3.92
primary educated urban labour	0.84	3.08	2.43	2.11	4.36	3.93
secondary educated urban labour	1.30	-1.42	5.75	-2.70	-6.21	1.85
tertiary educated urban labour	1.27	-1.87	6.29	-3.99	-7.77	1.07
Land	0.17	2.95	3.83	1.89	4.68	6.13
crop capital	1.06	4.88	-1.43	1.70	5.54	-0.48
livestock capital	0.86	5.24	4.97	2.73	6.97	7.18
mining capital	-8.70	-2.26	-11.39	4.25	12.08	0.05
other capital	1.29	4.22	4.78	3.74	6.85	7.60

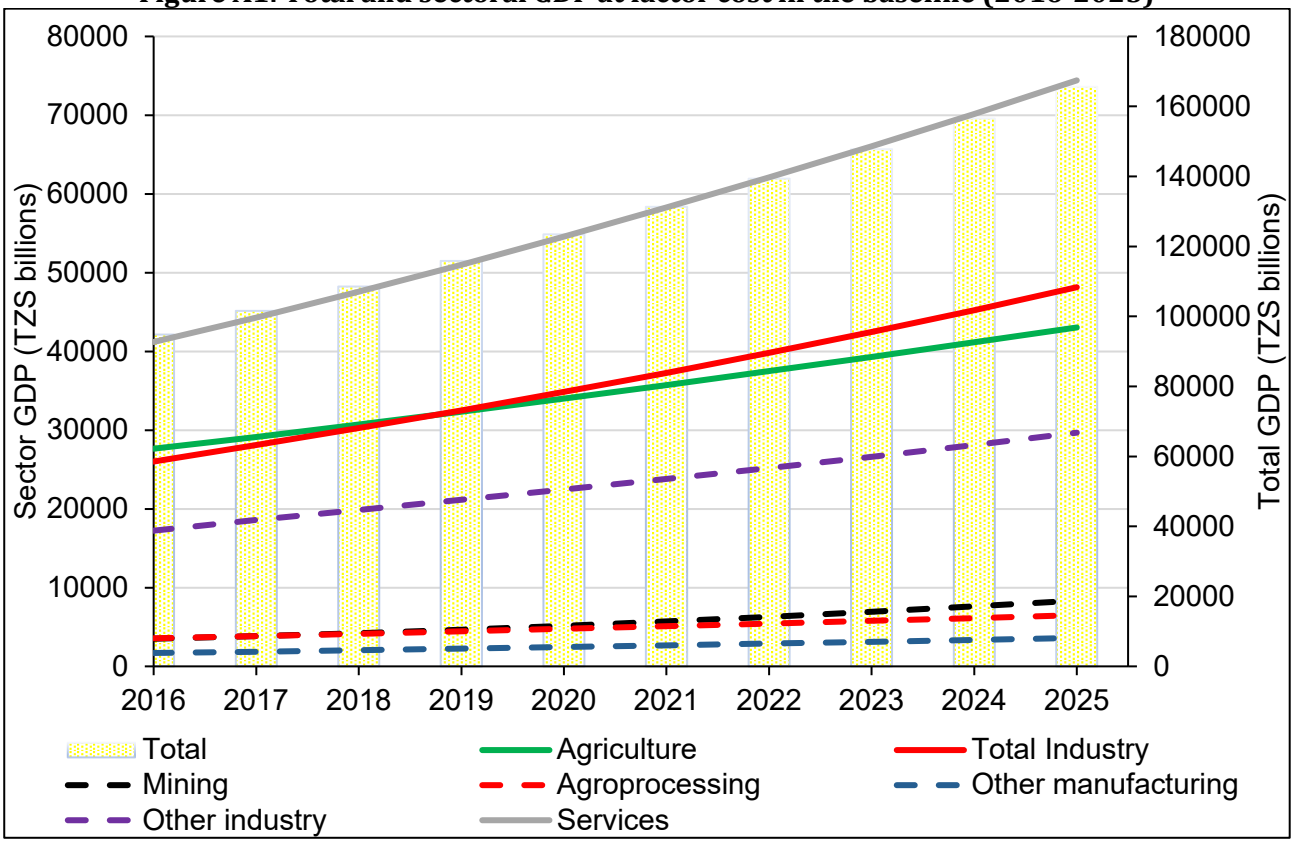
Source: Tanzania Model results

Table A5: Sensitivity analysis on household incomes (2025)

	TFPwe scenario			EDUC scenario		
	Original closure	S-I closure	Land closure	Original closure	S-I closure	Land closure
hhd-f1	0.4	0.59	0.18	2.48	2.59	2.49
hhd-f2	0.4	0.58	0.26	2.52	2.63	2.60
hhd-f3	0.5	0.62	0.80	2.61	2.72	3.21
hhd-f4	0.5	0.63	0.98	2.60	2.70	3.36
hhd-f5	0.5	0.67	1.43	2.62	2.72	3.79
hhd-n1	0.1	0.30	-1.42	2.92	3.06	1.47
hhd-n2	0.2	0.35	-0.76	2.96	3.11	2.13
hhd-n3	0.2	0.40	-0.21	2.98	3.11	2.66
hhd-n4	0.4	0.58	1.31	2.52	2.55	3.54
hhd-n5	0.8	0.88	4.09	0.76	0.44	4.18
hhd-u1	0.7	0.91	2.32	1.95	2.05	3.81
hhd-u2	0.7	0.88	2.98	2.43	2.58	4.93
hhd-u3	0.7	0.90	3.19	2.30	2.43	4.98
hhd-u4	0.7	0.91	3.67	2.28	2.41	5.40
hhd-u5	0.8	0.98	4.23	1.32	1.37	4.90

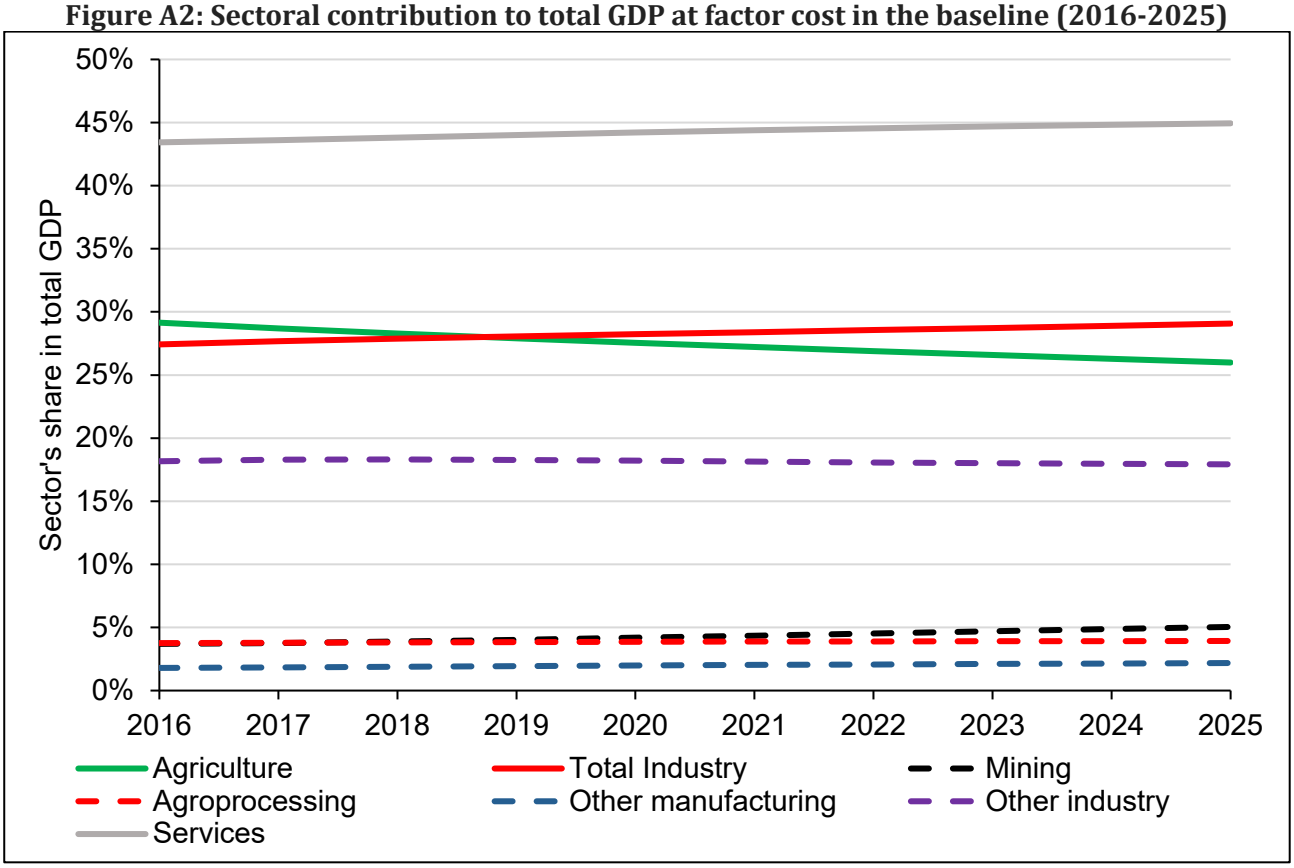
Source: Tanzania Model results

Figure A1: Total and sectoral GDP at factor cost in the baseline (2016-2025)



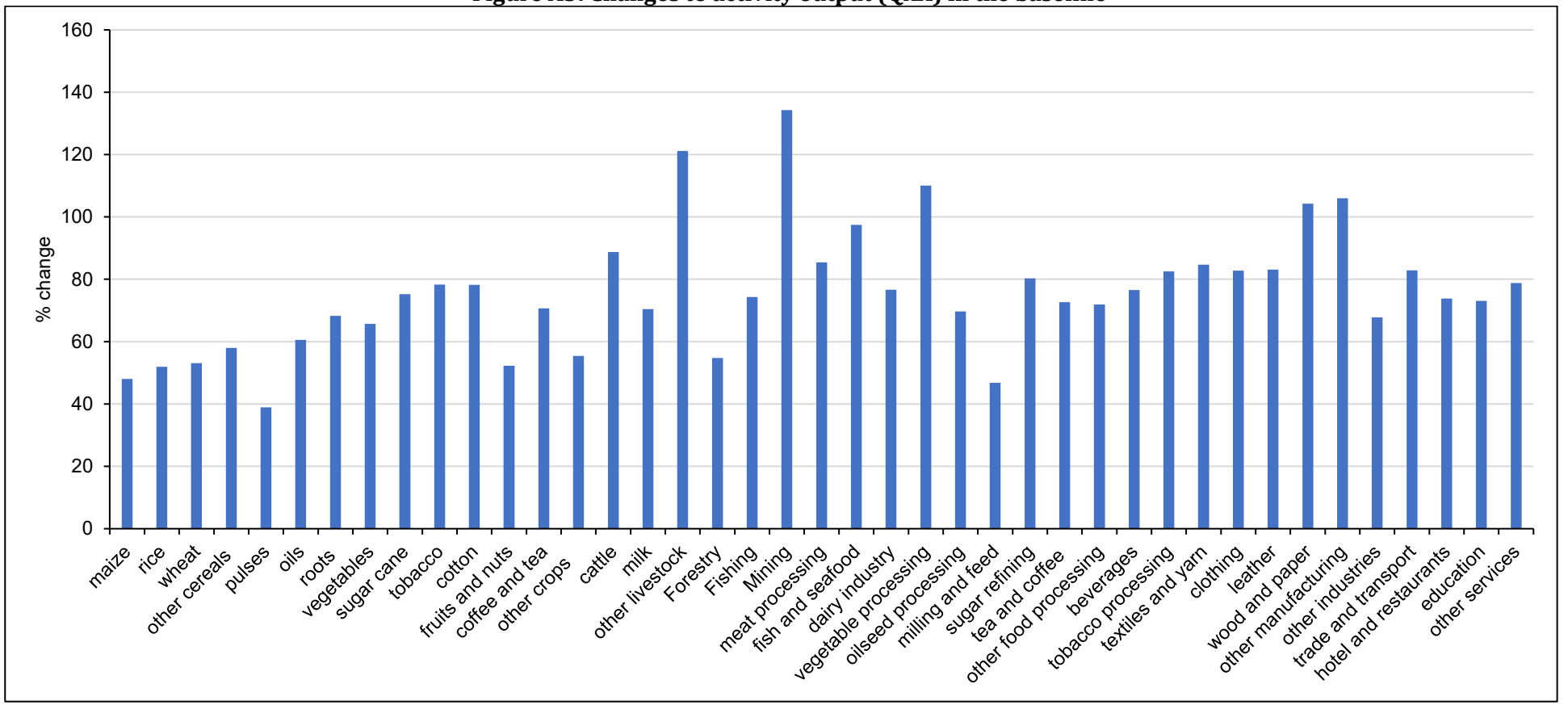
Source: Tanzania Model results

Figure A2: Sectoral contribution to total GDP at factor cost in the baseline (2016-2025)



Source: Tanzania model results

Figure A3: Changes to activity output (QXX) in the baseline



Source: Tanzania model results